5.10 OCEAN WATER QUALITY AND MARINE BIOLOGICAL RESOURCES

Information in this section was compiled from the Hydrodynamic Modeling of Source Water Make-Up and Concentrated Seawater Dilution for the Ocean Desalination Project at the AES Huntington Beach Generating Station (2004), prepared by Dr. Scott A. Jenkins Consulting; Watershed Sanitary Survey Report (2002), prepared by Archibald and Wahlberg Consultants; the California Ocean Plan (2001) prepared by the State Water Resources Control Board; Huntington Beach Desalination Facility Intake Effects Assessment (2004), prepared by Tenera Environmental; Evaluation of a Report on Receiving Water Chemistry and Quality Issues Related to the Operation of a Reverse osmosis Desalination Facility at the Huntington Beach Power Generating Station (2004), prepared by Jeffrey B. Graham, Ph.D.; Marine Biological Considerations Related to the Reverse Osmosis Desalination Project at the Applied Energy Sources Huntington Beach Generating Station (2004), prepared by Jeffrey B. Graham, Ph.D.; Existing Conditions for the Proposed Poseidon Desalination Project at Huntington Beach, California; and the Effects of a Concentrated Seawater Discharge on the Marine Environment of Huntington Beach, California prepared by MBC Applied Environmental Services.

EXISTING CONDITIONS

OCEAN WATER QUALITY

The Pacific Ocean is located approximately 2,000 feet south of the proposed project site, along Huntington State and Huntington City Beaches. Source water for the proposed desalination facility will be taken from the existing condenser cooling water circulation system from the Huntington Beach Generating Station facility (HBGS). Up to 507 million gallons per day (mgd) of cooling seawater presently flows to the HBGS through an existing ocean water intake structure located approximately 1,840 feet offshore. The Santa Ana River flows into the Pacific Ocean approximately 8,300 feet from the HBGS intake, while the Talbert Channel discharges into the ocean approximately 1,300 feet upcoast (northwest) from the mouth of the Santa Ana River. The Orange County Sanitation District (OCSD) deep ocean sewage outfall is located five miles offshore of the Santa Ana River at a depth of 195 feet (refer to Exhibit 5.10-1, *LOCATION MAP OF LOCAL SURFACE AND WASTEWATER DISCHARGES*). Bacteria levels are the primary Pacific Ocean water quality concern in the project vicinity.

Natural water temperatures in the Pacific Ocean fluctuate throughout the year in response to seasonal and diurnal variations in currents as well as meteorological factors such as wind, air temperature, relative humidity, cloud cover, ocean waves, and turbulence. Diurnally, natural surface water temperatures generally vary one to two degrees celsius in the summer and 0.3 to one degree celsius in the winter. Reasonably sharp thermoclines (differences between surface and bottom water temperatures) are known to occur in the nearshore waters of Huntington Beach at a depth of 12 to 15 meters during the summer, and are typically absent during the winter. Salinities in the area are fairly uniform and normally range from 33.0 to 34.0 parts per thousand (ppt), while levels of dissolved oxygen range from approximately five to 13 milligrams per liter (mg/L).

Recently, Huntington Beach has experienced several closures of the water area adjacent to the beach. The closures have been due to levels of bacteria in the surf zone that have exceeded the State standard. These closures have prompted a series of studies in order to find the source of contamination that is causing bacteria levels in the surf zone to exceed State standards. A review of multiple studies conducted finds HBGS is not the source of bacteria in the surf zone. A discussion of bacteria in the ocean surrounding the subject site is discussed in Section 4.0, *EXISTING CONDITIONS*.

Potential Sources of Contamination in Proximity to the HBGS Intake

There are a number of discharges and potential sources of contaminants in the vicinity of the HBGS intake (which will be the source of water for the proposed desalination facility). These potential contaminant sources were investigated to determine the quality of water that will enter the desalination facility. A hydrodynamic modeling study was conducted by oceanographers at the Scripps Institution of Oceanography to determine if several of the potential sources of contaminants in the vicinity of the HBGS intake could affect the quality of water at the generating station intake. Appendix E, *WATERSHED SANITARY SURVEY* contains a more thorough discussion of each of the potential contaminant sources, and Appendix C, *HYDRODYNAMIC MODELING REPORT* contains a detailed discussion of the modeling results.

<u>OCSD Wastewater Discharge</u>

Although disinfection of the OCSD effluent reduces bacteria in the discharge to the level of beach standards in the zone of initial dilution, the potential for the OCSD discharge to impact water quality at the intake of the HBGS was investigated. OCSD discharges a mix of primary and secondary treated wastewater at an outfall that is located 4.5 miles offshore at a depth of 195 feet. The OCSD outfall is located southeast of the HBGS intake (refer to Exhibit 5.10-1, *LOCATION MAP OF LOCAL SURFACE AND WASTEWATER DISCHARGES*).

Under normal oceanographic conditions, the HBGS intake and OCSD discharge are segregated in two different water masses by ocean thermal stratification, with no appreciable exchange between those water masses. Currents generally flow downcoast (i.e. southeast) from the OCSD outfall. The OCSD wastewater discharge would have the greatest potential to impact water quality at the HBGS intake with summer El Nino conditions when net transport by waves and currents is upcoast toward the HBGS intake. A modeling study was conducted to determine if OCSD discharge could potentially affect water quality at the intake of the generating station (the results of the modeling study are discussed below, under *IMPACTS*).

<u>Urban Storm Water Runoff</u>

The Santa Ana River and Talbert Marsh (located southeast of the HBGS intake) are known sources of fecal indicator bacteria to the surf zone during storm events. A modeling study was conducted to determine if these two sources could potentially affect water quality at the intake of the generating station (the results of the modeling study are discussed below, under *IMPACTS*).

Storm water discharges from the Santa Ana River and Talbert Marsh would have the greatest potential to impact water quality at the HBGS intake if an extreme storm event coincided with an El Nino winter and maximum pumping of cooling water into the generating station. Although it is unlikely that all of these events would coincide with one another, this was considered to be the "worst-case" scenario for determining if the Santa Ana River and Talbert Marsh contribute contaminants to the HBGS intake.

INSERT EXHIBIT 5.10-1, LOCATION MAP OF LOCAL SURFACE AND WASTEWATER DISCHARGES

Dry Weather Runoff

Several studies have shown that the Talbert Marsh is a significant source of fecal indicator bacteria in the surf zone. A modeling study was conducted to determine if dry weather runoff from the Talbert Marsh could affect water quality at the intake of the generating station (the results of the modeling study are discussed below, under *IMPACTS*). Most of the dry weather runoff is now diverted to OCSD for treatment and discharge at the deep water outfall. However, fecal indicator bacteria levels at the outlet of the marsh remain high and these bacteria are flushed out of the marsh, particularly during spring tides.

Recirculation of HBGS Discharge

The HBGS outfall is located 340 feet from the intake. The National Pollution Discharge Elimination System (NPDES) permit for the HBGS allows the facility to discharge up to 516 million gallons per day (mgd). The discharge consists largely of cooling water but up to 1.66 MGD of generating station process wastewater and storm water can be mixed with the cooling water and discharged at the outfall. In addition, upon project implementation, there is a potential for the desalination facility's reverse osmosis (RO) to be recirculated, as the concentrated seawater would be discharged through the HBGS outfall.

Recirculation of the HBGS discharge would have the greatest potential to impact water quality at the intake during wet weather conditions when the maximum amount of storm water is being discharged through the outfall.

Los Angeles and San Gabriel Rivers

The Los Angeles River discharges to the ocean approximately 16 miles upcoast (i.e. northwest) from HBGS, while the San Gabriel River discharges approximately 11 miles upcoast. The United States Geological Survey (USGS) conducted an intensive ocean water quality monitoring program in the summer of 2001 and found a mass of lower-salinity water near the shore in Huntington Beach. The source of the nearshore low-salinity water was not identified in their study but the authors of the report speculated that it may be coming from the San Gabriel and Los Angeles rivers (USGS, 2003). There have been no further studies on the potential impact of these two rivers.

Cruise Ships and Fishing Boats

Cruise ship and fishing boat operations in the vicinity of the HBGS intake have the potential to impact water quality in regards to sewage discharge and leaks or spills of oil/fuel. The nearest major port for cruise ships to the HBGS intake is the Long Beach Harbor, situated approximately 16 miles upcoast. Another major port for cruise ship operations is the Los Angeles Harbor, located approximately 18 miles upcoast of the HBGS intake.

Sportfishing in Orange County is done mostly from piers and boats. A commercial passenger and private fishing vessel fleet, based in Newport Bay, operates in the vicinity of Newport and Huntington Beach. Charter boats operating off Newport and Huntington Beach fish the artificial reefs and sandy bottom, or the rocky areas and kelp beds to the south offshore of Corona Del Mar and Laguna Beach, typically in water depths of 14 to 18 meters deep (OCSD, 2002a).

Recreation

It is estimated that over five million people visit Huntington State Beach each year for recreational purposes. Such users have the potential to affect water quality at the HBGS intake due to sewage and spills of contaminants such as lighter fluid used for bonfires.

Oil and Gas Production Facilities

There are two offshore oil platforms approximately 1.5 miles west of the HBGS intake and four platforms approximately 10 miles west of the intake. Oil and gas pipelines connect the platforms to coastal oil/gas facilities upcoast from the intake. There are no oil tanker shipping lanes in the vicinity of the intake. The closest shipping lanes are six to seven miles offshore. There have not been any reportable spills or leaks from the offshore oil platforms or the pipelines.[1] A catastrophic event at one of the offshore platforms that is near the coast could affect water quality at the HBGS intake.

Red Tides and Algal Toxins

Refer to Section 5.11, *PRODUCT WATER QUALITY* for a discussion of existing conditions in regards to red tides and algal toxins.

Operations at HBGS

Source water quality for the proposed desalination facility has the potential to be affected by HBGS operations. Activities or conditions occurring along the HBGS cooling water system between the HBGS intake and the point at which water is diverted toward the desalination facility could impact water quality (particularly in regards to metals). The diversion point would occur after cooling water has traveled through the HBGS condensers. Other potential sources of contamination at HBGS include cycle water discharges (the discharge of HBGS process byproduct water at various points into the cooling water system), urban runoff discharges, wastewater discharges, hazardous materials, and heat treatments (the periodic diversion of water from the discharge vault back into the cooling water system to be reheated to prevent biological growth). These potential contaminant sources are further analyzed below, under *IMPACTS.*

Elevated Bacteria Levels in the Huntington Beach Surf Zone

Extensive bacterial studies have shown that the Santa Ana River and Talbert Marsh appear to be the primary sources of fecal indicator bacteria to the near shore ocean. In addition, bird droppings and a reservoir of bacteria stored in the sediment and on marine vegetation may continue to be the source of bacteria at the mouths of the river and marsh. Modeling studies and monitoring data indicate that there is likely another unidentified source of bacteria in the vicinity of Stations 6N and 9N. However, three separate studies conducted between 2001 and 2002 have demonstrated that HBGS is not the source of bacteria in the surf zone. Additional information in regards to existing conditions for the elevated bacteria levels in the Huntington Beach surf zone is provided in Section 4.0, *EXISTING CONDITIONS.*

MARINE BIOLOGY

The marine environment offshore of the proposed project site exists within a biologically and climatologically unique region called the Southern California Bight (SCB). Geographically, the SCB

[1] Personal communication, Dave Sanchez, California Division of Oil, Gas, and Geothermal Resources.

is an open embayment extending from Point Conception, California into Baja California, Mexico and 125 miles offshore (refer to Figure 4-1, *SOUTHERN CALIFORNIA BIGHT*). Biologically, the SCB is a transition-zone species assemblage positioned between two larger and diverse assemblages: one in the cooler waters to the north, and the other in the warmer waters to the south. SCB organisms comprise a mix of species (some from the cooler northern waters and some from the warmer southern waters). [2]

Physical, biological, and oceanographic factors affect the total SCB biomass and cause year-to-year variation in the number of species occurring within the SCB and in areas such as Huntington Beach. While ocean temperature, current patterns, and upwelling affect nutrient and food supplies, biological variables such as the arrival of planktonic animals to coastal areas, the recruitment of new organisms (addition of young-of-the-year to the population) and habitat availability and quality all influence ecosystem-species composition, diversity, and biomass (Jackson, 1986). The young stages of most marine invertebrates and fishes living at and near Huntington Beach and throughout the SCB begin life as drifting plankton. Their survival into the next life stage requires that the appropriate and vacant habitat be found. Thus, evaluation of either local or regional habitats with respect to their biodiversity, the abundance of different species, and the ages, body size, and growth rates of specific organisms must always be made in the context of the large-scale factors influencing these, whether in the area around Huntington Beach or across the entire SCB.

As stated in Section 4.0, *EXISTING CONDITIONS/ENVIRONMENTAL SETTING,* the marine organisms living in the vicinity of the HBGS discharge occur in one of three habitat classifications: 1) substrate (termed infauna); 2) on the bottom seafloor (termed macroinvertebrates, including worms, crabs, sand dollars, starfish and some fishes); or 3) in the water column itself (consisting of squid, fish, plankton, etc.).

- **Infauna:** Huntington Beach infauna surveys were carried out from 1975 to 1993 by MBC Applied Environmental Sciences (MBC, 1993). The habitat surrounding the HBGS outfall is dynamic and there are many species that can potentially occur in the infauna. However, many of these are rare or appear episodically. Most of these animals have very short lives and it is reasonable to assume that many of them arrive each year in the plankton. Thus, the infaunal species diversity of the extended habitat varies from year to year as does organism age, size, and abundance.

  Table 5.10-1, *MAJOR GROUPS OF INFAUNAL ANIMALS AT HUNTINGTON BEACH, 1975-1993,* summarizes the total diversity of infaunal organisms found over 18 years of study. Table 5.10-2, *ORDER OF ABUNDANCE OF INFAUNAL ANIMALS AT HUNTINGTON BEACH, 1975-1993,* lists the infaunal species in order of their mean abundance from 1975 to 1993. Figure 5.10-1, *INTERANNUAL VARIATION IN HUNTINGTON BEACH INFAUNAL ABUNDANCE AND SPECIS RICHNESS,* shows the numbers of species and numbers of individuals found in samples over time. Average animal density was about 43 per unit volume, but this varied from year to year and by a factor of five over 18 years. In terms of both numbers and species, the most dominant animals each year were polychaete worms and crustaceans. Mollusks were the third most abundant group and showed marked variation from year to year.

- **Benthic macrofauna:** Macrofaunal surveys, conducted from 1975 to 2000, show the repeated occurrence of the same core group of species in the area (MBC, 2001). The

[2] Marine Biological Considerations Related to the Reverse Osmosis Desalination Project at the AES Huntington Beach Generating Station, J.B. Graham, Ph.D., August 3, 2004 (refer to Appendix S, *MARINE BIOLOGICAL CONSIDERATIONS).*

macrofaunal species occurring at Huntington Beach are typical of those expected to occur at other comparable open, sandy bottom habitats throughout the SCB. Table 5.10-3,

Table 5.10-1
MAJOR GROUPS OF INFAUNAL ANIMALS AT HUNTINGTON BEACH, 1975-1993

Taxon	Species
CNIDARIA	
Anthozoa	
	Renilla kollikeri [1]
NEMERTEA	
	Carinoma mutabilis
	Lineidae, unid.
	Nemertea, unid.
	Paranemertes californica [2]
	Tubulanus cingulatus
	Tubulanus nothus
	Tubulanus pellucidus/polymorphus [3]
SIPUNCULA	
	Siphonosoma ingens
	Thysanocardia nigra
ANNELIDA	
Polychaeta	
	Ancistrosyllis groenlandica
	Acmira catherinae
	Amaeana occidentalis
	Ampharete labrops
	Apoprionospio pygmaea
	Asychis disparidentata
	Chaetozone cf. setosa
	Chaetozone corona
	Chone albocincta
	Chone mollis
	Diopatra ornata
	Diopatra splendidissima
	Glycera convoluta
	Goniada littorea
	Harmothoe sp. B of SCAMIT*
	Lumbrineris californiensis
	Lumbrineris tetraura
	Lumbrineris spp.
	Magelona pitelkai
	Mediomastus spp. [4]
	Microphthalmus hystrix
	Nephtys caecoides
	Onuphidae unid.
	Onuphis eremita
	Onuphis eremita parva
	Owenia collaris
	Paraprionospio pinnata
	Pectinaria californiensis
	Pista nr. disjuncta
	Podarkeopsis glabrus [5]
	Prionospio lighti [6]
	Scoloplos armiger
	Sigalion spinosa
	Spiophanes bombyx
	Spiophanes missionensis
	Sthenelais verruculosa
	Tharyx sp. A of SCAMIT [7]
	Tharyx tesselata [7]
	Typosyllis aciculata
CRUSTACEA	
Copepoda	
	Paralteutha simile
Ostracoda	
	Euphilomedes carcharodonta
	Euphilomedes longiseta
	Parasterope barnesi
	Rutiderma rostrata
Cumacea	
	Campylaspis sp. C of MBC
	Cumella sp. A of MBC
	Diastylopsis tenuis
	Leptocuma forsmani
CRUSTACEA (cont).	
Isopoda	
	Edotea sublittoralis
	Uromunna ubiquita [8]
Amphipoda	
	Ampelisca brachycladus
	Aora sp. [9]
	Aoridae, unid.
	Argissa hamatipes
	Cerapus " tubularis"
	Ericthonius brasiliensis
	Gibberosus myersi [10]
	Monoculodes hartmanae
	Pachynus barnardi
	Photis californica
	Photis macinerneyi
	Rhepoxynius menziesi [11]
	Rhepoxynius sp. A of SCAMIT [12]
	Stenothoe sp.
	Synchelidium shoemakeri
Decapoda	
	Neotrypaea californiensis [13]
	Ogyrides sp. A of Roney
	Pinnixa forficulimanus
	Pyromaia tuberculata
MOLLUSCA	
Gastropoda	
	Armina californica
	Balcis rutila
	Crepidula norrisiarum
	Crepidula sp.
	Cylichnella harpa
	Kurtziella plumbea
	Nassarius sp.
	Odostomia sp.
	Olivella baetica
	Ophiodermella cancellata
	Philine bakeri
	Rictaxis punctocaelatus
	Sulcoretusa xystrum
	Turbonilla pedroana
Pelecypoda	
	Cooperella subdiaphana
	Macoma sp.
	Mysella sp. A of SCAMIT
	Nucula tenuis
	Periploma planiusculum
	Siliqua lucida
	Solen sicarius
	Tellina modesta
	Yoldia cooperi
PHORONIDA	
	Phoronida, unid.
BRACHIOPODA	
	Glottidia albida
ECHINODERMATA	
Ophiuroidea	
	Amphiodia psara
	Amphiura arcystata [14]
	Amphiuridae sp. A of MBC [15]
	Ophiuroidea, unid.
HEMICHORDATA	
	Enteropneusta, unid. [16]

Source: MBC, 1993

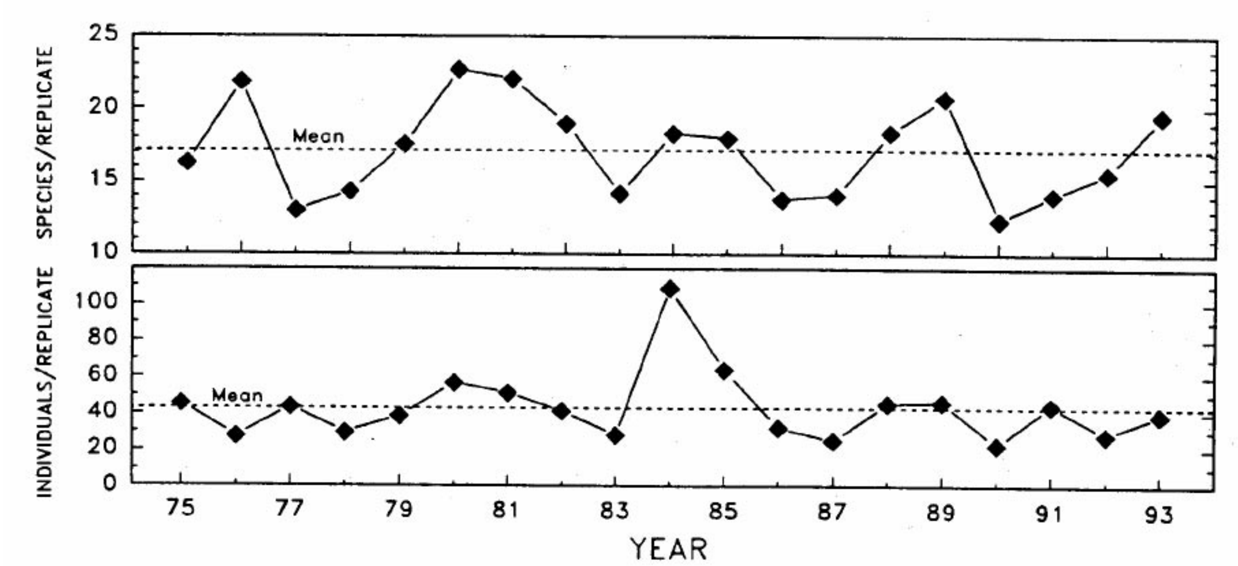
Table 5.10-2
ORDER OF ABUNDANCE OF INFAUNAL ANIMALS AT HUNTINGTON BEACH, 1975-1993

Species	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Mean	SD
Apoprionospio pygmaea	680	430	360	360	44	100	300	50	720	440	21	167	42	133	96	88	1513	29	79	297.4	376.5
Rhepoxynius menziesi	-	-	28	150	290	280	150	180	160	340	675	194	212	975	229	413	496	142	73	262.4	250.0
Diastylopsis tenuis	380	120	270	180	540	530	330	160	160	50	25	794	183	438	83	125	54	96	94	242.8	213.7
Goniada littorea	450	370	380	350	290	240	380	220	210	90	192	389	175	171	213	204	13	233	25	241.8	117.8
Olivella baetica	130	90	44	140	110	25	110	110	4	60	1950	11	29	33	21	33	25	8	1	154.4	460.3
Owenia collaris	-	-	-	180	240	180	800	-	150	40	88	-	-	8	750	54	400	-	4	152.3	253.5
Polydora nuchalis	-	-	-	-	-	-	340	-	30	1470	167	72	-	-	-	-	-	-	-	109.4	358.5
Crepidula naticarum	-	-	-	20	-	20	70	50	-	1670	104	28	-	25	-	-	-	-	-	104.6	401.3
Chaetozone cf. Setosa	60	120	210	20	17	60	10	250	40	20	292	11	200	13	183	121	42	92	14	93.4	94.4
Tharyx sp.	690	280	170	30	17	30	70	80	40	40	-	161	38	-	-	-	-	-	36	88.5	171.0
Mediomastus spp.	-	-	-	100	250	230	80	80	10	30	13	122	233	38	42	100	4	250	48	85.8	85.7
Leitoscoloplos pugettensi	40	210	180	50	39	150	80	300	80	40	92	122	71	-	13	-	4	83	-	81.8	83.0
Tellina modesta	10	-	10	50	90	680	110	50	10	120	8	28	79	17	29	8	-	-	10	68.9	160.3
Dendraster excentricus	-	120	-	-	6	-	130	150	20	310	21	6	12	46	117	21	63	142	-	61.2	82.8
Eohaustorius washingtonianus	-	-	-	190	90	4	10	13	-	90	50	56	100	108	200	83	50	50	-	60.8	63.7
Prionospio lighti*	70	50	40	50	17	200	4	70	30	30	21	6	-	271	58	79	8	63	5	56.5	71.9
Amaeana occidentalis	5	50	50	40	56	10	60	20	10	180	104	-	33	13	4	4	-	258	96	52.3	46.4
Pectinaria californiensis**	40	20	20	70	17	20	10	40	20	320	88	-	8	179	21	8	13	-	4	47.2	81.4
Spiophanes bombyx	50	20	20	30	22	50	20	-	90	170	100	17	21	71	63	33	33	58	24	47.0	41.7
Magelona sacculata	-	-	-	30	33	190	30	80	10	10	150	-	12	46	67	63	75	33	-	43.6	54.3
Photis spp.	60	-	20	-	-	10	17	30	-	410	46	44	4	25	4	4	25	-	-	36.8	96.8
Paraprionospio pinnata	-	40	10	-	6	20	140	100	20	180	17	61	33	8	4	-	-	46	8	36.5	53.4
Ampharete labrops	-	-	10	10	16	30	4	10	10	440	42	22	-	4	38	8	25	8	4	35.8	104.1

Amastigos acutus	-	-	-	-	250	260	80	4	50	-	4	-	-	-	-	-	-	-	-	34.1	84.5
Typosyllis spp.	120	170	-	80	-	-	30	30	40	-	-	-	42	33	29	38	13	-	-	32.9	47.1
Leptocuma forsmanni	20	10	20	20	60	30	20	-	4	11	8	33	29	88	121	42	33	63	10	32.7	31.4
Isocheles pilosus	-	4	10	-	-	330	-	20	10	-	-	6	-	100	96	-	8	-	-	30.7	82.4
Leptopecten latiauratus	5	-	40	-	-	30	40	20	10	290	29	6	-	-	-	-	-	-	-	24.7	69.2
Thalenessa spinosa***	20	50	30	4	17	20	21	20	20	110	59	-	17	8	-	17	-	-	-	21.7	27.3
Rhepoxynius spp.	5	10	10	120	-	20	10	-	-	-	50	17	29	55	-	4	17	8	-	18.7	30.6
Neverita recluziana	-	-	-	-	6	4	10	20	10	130	42	6	8	13	8	-	-	-	-	13.5	31.4

* previously Prionospio cirrifera
** previously Cistena californiensis
** previously Eusigalion spinosum
Source: MBC 1975-1992

Figure 5.10-1
INTERANNUAL VARIATION IN HUNTINGTON BEACH INFAUNAL ABUNDANCE AND SPECIS RICHNESS, 1975-1993



MACROFAUNAL INVERTEBRATES AT HUNTINGTON BEACH, 1976-2001 lists key macrofaunal invertebrate species surveyed at Huntington Beach. Graphs showing animal abundance and species number for the area reflect the range of annual differences that commonly occur in shallow water habitats (refer to Figure 5.10-2, *INTERANNUAL VARIATION IN HUNTINGTON BEACH MACROFAUNA ABUNDANCES AND SPECIES RICHNESS, 1975-2001*). Average abundances of these and other organisms and total species number varied from year to year. In 1975 and 1980 only 21 species were recorded. In 1994 just after the 1992-1993 El Niño, there were 54 species (Figure 5.10-2). Animal densities also vary considerably, from less than 20 per square meter in 1975 and 1976 to over 160 per square meter in 1990.

From 1975 to 2001, five animal groups (three annelid [polychaete] worms [Diopatra, Owenia, Maldanidae], hermit crabs [Paguridae] and Pacific sand dollars [Dendraster excentricus]) account for about 90% of the marcrofaunal abundance. The relative numbers of these organisms vary from year to year and in different localities and they could be especially abundant, with as many as 3,600-9,000 individuals of various species (sand dollars, polychaete worms, hermit crabs) being taken in one otter trawl net at one sampling site. Pacific sand dollars, for example, were found in great abundance near the discharge and at the upcoast sampling area in 1997, but had not been found in these areas in the preceding four years and have appeared variably at all stations over the survey and are not consistently found in the waters around the HBGS.

- **Fishes:** Since the fish surveys began, 65 species have been collected, all of which can be considered as typical residents of open, sandy bottom coastal habitats in southern California (Horn and Allen, 1978; Mearns, 1979; Allen and DeMartini, 1983). The numbers of fish species taken in Huntington Beach trawl surveys ranged from 13 in 1999 to 29 in 1986 and averages 22 species/year. The fifteen most abundant fish species living in the area between 1976 and 2000 are: white croaker, queenfish, northern anchovy, California halibut, Pacific

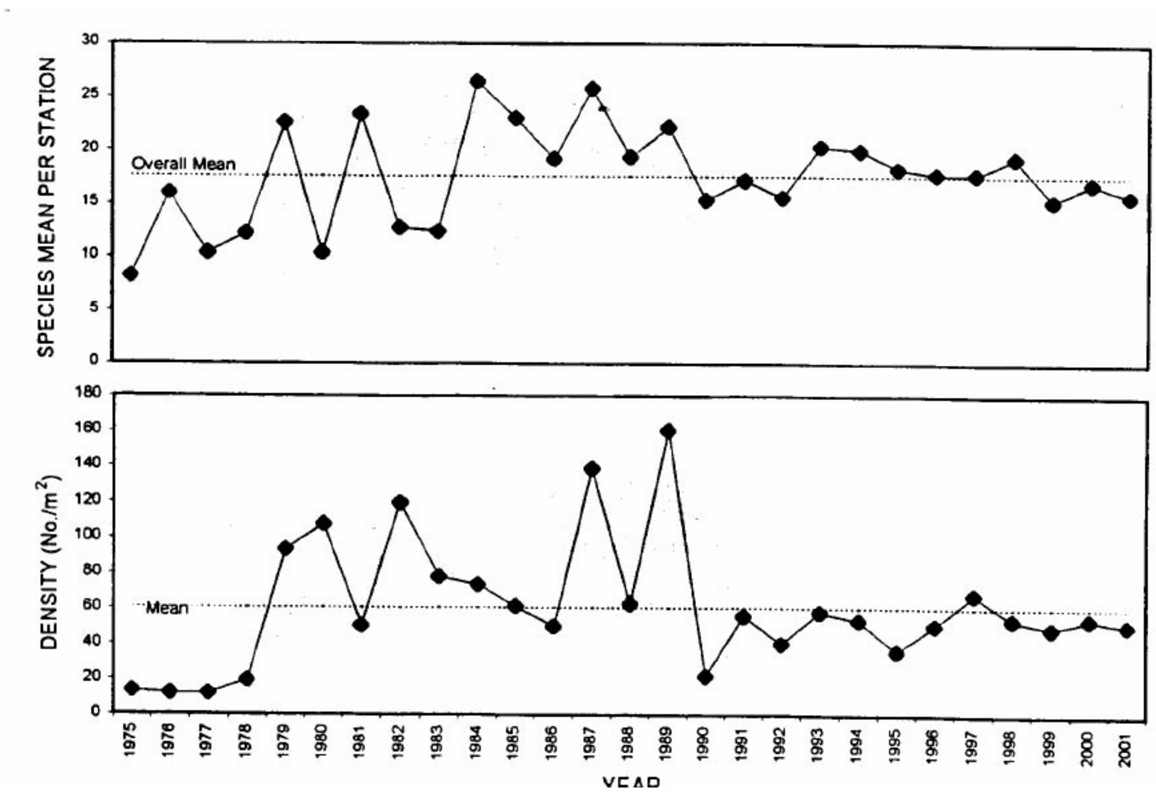
Table 5.10-3
MACROFAUNAL INVERTEBRATES AT HUNTINGTON BEACH, 1976-2001

	Year																												Percent
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Mean	Total
Total Number of Species	21	38	23	27	48	21	39	24	25	54	43	36	43	32	46	29	37	32	40	29	26	29	26	31	24	27	25	32.4	
Mean Number of Individuals (per m²)	13.6	11.8	11.8	19.3	93.3	107.3	50.2	119.4	78.0	73.7	61.8	49.9	139.1	63.1	160.7	22.0	56.1	40.5	58.1	53.6	36.2	51.0	66.4	53.9	49.4	54.5	51.3	61.0	
Mean Densities of Key Species (per m²)																													
Diopatra spp	10.2	5.1	7.7	10.2	10.9	17.8	19.1	23.2	28.6	28.1	43.9	39.1	26.2	10.2	7.9	11.1	40.0	19.6	42.4	43.8	29.0	40.0	23.3	45.5	42.1	44.7	38.2	26.2	45.1
Paguridea, unid. (includes *Isocheles* sp)	0.0	1.8	1.1	0.2	2.0	0.2	1.6	90.4	0.7	0.5	3.7	0.7	101.9	13.6	128.3	0.5	0.3	10.7	0.3	0.4	0.1	0.5	0.4	0.1	0.2	0.1	0.7	13.4	23.0
Owenia spp	-	-	-	2.1	67.5	85.9	16.2	-	6.6	1.8	0.1	-	0.0	1.8	1.1	0.6	7.4	0.0	0.0	0.1	0.0	0.0	-	0.2	-	-	-	7.1	12.2
Dendraster excentricus	-	-	-	-	-	-	-	-	35.0	20.2	0.0	-	-	2.5	11.8	1.1	0.4	-	-	-	-	-	36.9	-	-	-	-	4.0	6.9
Maldanidae, unid.	0.1	0.2	1.3	1.2	2.7	0.0	1.0	0.3	0.3	0.6	2.3	0.2	1.1	1.0	3.0	2.8	3.1	7.1	3.6	0.2	0.8	1.2	1.7	0.6	0.5	0.8	1.6	1.5	2.5
Ophiuroidea, unid.	-	0.1	0.0	0.0	0.1	-	0.2	0.0	0.3	1.2	2.1	0.7	1.9	0.4	0.6	2.9	1.5	0.4	3.7	1.2	1.5	1.4	1.4	2.6	1.6	3.3	1.0	1.1	1.9
Leptopecten latiauratus	-	-	-	-	0.1	-	0.1	-	-	0.3	1.5	-	0.0	14.0	0.0	-	0.0	0.1	0.0	0.9	0.1	0.1	0.0	0.0	0.0	0.2	0.2	0.7	1.1
Balanus spp	0.0	0.3	-	-	0.3	0.4	2.6	2.1	-	0.0	0.1	0.2	0.3	-	2.3	0.1	0.1	0.3	1.7	0.9	0.4	2.1	0.1	-	0.1	1.8	1.5	0.7	1.1
Crepidula spp	-	0.1	-	-	-	-	0.1	1.7	0.1	0.6	0.7	0.7	0.5	0.9	0.9	0.9	0.3	0.3	0.5	1.9	-	-	0.0	0.5	0.1	0.1	1.8	0.5	0.8
Majidae, unid.	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1	0.0	0.1	0.0	0.1	0.7	1.5	0.1	2.5	0.5	0.5	0.7	0.8	4.5	0.5	0.8
Zaolutus actius	-	0.0	0.0	-	0.4	0.0	1.0	0.0	0.6	0.6	0.0	0.2	0.1	-	-	-	0.0	0.1	0.9	0.2	0.7	0.5	0.2	0.8	2.2	0.5	0.2	0.3	0.6
Olivella spp	1.9	0.2	-	0.0	0.2	-	0.1	0.0	-	0.7	0.4	0.0	0.1	2.2	0.3	0.1	0.0	-	0.0	0.3	-	0.0	0.1	0.2	-	0.1	0.1	0.3	0.4
Spiochaetopterus costarum	0.1	0.1	0.0	0.1	0.2	-	0.1	0.2	0.1	0.1	0.1	0.7	0.1	0.6	-	0.5	1.0	0.7	0.1	0.0	0.1	0.0	0.9	0.5	-	-	-	0.2	0.4
Astropecten armatus	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.9	0.3	0.4	0.5	0.4	0.6	0.1	0.1	0.2	0.2	0.4	0.2	0.3
Dendronotus frondosus	-	-	-	-	4.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.3
Nassarius spp	-	0.0	-	0.0	0.1	0.0	0.1	-	-	0.6	0.1	0.1	0.3	1.6	0.1	0.1	0.1	0.0	0.1	-	-	0.0	0.2	0.0	0.2	0.1	0.1	0.1	0.3
Pista spp	-	0.1	0.1	0.0	0.1	0.1	0.2	-	0.2	-	0.6	0.1	1.2	-	-	0.2	0.3	0.2	0.1	0.1	-	-	-	0.0	-	0.0	0.0	0.1	0.2
Hiatella arctica	-	-	-	-	-	-	-	-	3.3	0.2	-	0.0	-	-	0.0	-	-	-	-	0.0	-	-	-	-	-	-	-	0.1	0.2
Phyllochaetopterus spp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4	-	-	0.0	-	-	1.3	0.8	0.6	-	-	-	-	0.1	0.2
Stylatula elongata	0.0	0.0	-	-	-	-	0.0	-	0.0	0.2	0.2	-	0.0	-	-	-	-	0.1	0.6	0.4	0.3	0.1	0.4	0.3	0.1	0.2	0.2	0.1	0.2
Renilla kollikeri	-	-	-	-	0.0	-	0.0	0.0	-	0.0	0.1	0.1	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2
Solen spp	-	-	-	-	-	-	-	-	-	1.1	0.0	-	-	-	-	-	-	-	1.2	0.3	0.2	0.0	-	-	-	-	-	0.1	0.2
Pyromaia tuberculata	0.0	0.0	-	-	0.2	-	0.7	0.0	0.0	0.4	0.2	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	-	0.1	0.3	0.2	0.4	0.0	-	0.1	0.2
Chaetopterus variopedatus Cmplx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	0.1	0.0	0.1	0.1	0.3	0.2	0.1	0.2	0.2	0.4	0.1	0.1	0.1	0.2
Harenactis attenuata	0.1	-	-	-	-	-	-	-	-	-	-	-	0.1	0.0	0.1	0.3	0.2	-	-	-	-	-	-	0.4	0.35	0.8	-	0.1	0.1
Polygireulima rutila (Balcis rutila)	-	0.0	0.0	-	0.0	-	0.1	0.0	0.0	0.3	-	0.5	0.4	0.5	0.1	-	-	-	-	-	-	-	-	0.1	0.02	-	-	0.1	0.1
Thalamorporella spp	-	0.1	0.1	-	0.2	-	0.2	0.4	-	0.1	0.1	0.1	-	-	0.0	0.1	0.0	-	0.2	-	-	-	-	-	-	-	-	0.1	0.1
Neverita reclusiana	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	-	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Ophiodermella spp	-	-	0.0	0.0	-	0.1	0.3	0.0	-	0.1	0.0	-	0.0	-	-	0.0	0.0	0.1	0.1	-	-	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1
Anthozoa, unid.	-	-	-	-	-	0.1	-	-	-	0.4	0.4	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.1	-	-	0.0	0.1
Argopecten circularis	-	-	-	-	-	-	-	-	-	-	0.3	0.0	0.1	-	-	-	-	0.0	0.7	-	-	-	-	-	-	-	-	0.0	0.1

For 1975 and 1978 data was taken from the same 5 stations sampled since 1977
Note 0.0 = <0.05

Source: MBC, 2001

Figure 5.10-2
INTERANNUAL VARIATION IN HUNTINGTON BEACH MACROFAUNA ABUNDANCES AND SPECIES RICHNESS, 1975-2001



sardine, speckled sanddab, curflin turbot, kelp pipefish, white seaperch, walleye surfperch, C-O turbot, Pacific butterfish, California lizard fish, salema, and barred surfperch (refer to Table 5.10-4, YEARLY ABUNDANCE OF DEMERSAL FISH SPECIES COLLECTED BY OTTER TRAWL AT HUNTINGTON BEACH, 1976-2001). The persistent representation of the same species indicates that the fish fauna is relatively stable.

Conclusions of the MBC Monitoring

The overall findings of MBC in its NPDES monitoring program are as follows (MBC, 2001):

Operation of the HBGS had no detectable adverse effects on the marine biota or the beneficial uses of the receiving waters:

- There are strong indications that a relatively stable assemblage of organisms occur in the marine habitats near the discharge and, although the numbers and relative abundance rankings of species shift from year to year, no species has either been recruited to or eliminated from the area;
- All of the organisms occurring in waters adjacent to the HBGS have much broader geographic distributions, extending in most instances to beyond the range of the Southern California Bight;
- Both the sea floor and littoral water habitats occurring near the HBGS discharge site are not home to any endangered marine species;

Table 5.10-4
YEARLY ABUNDANCE OF DEMERSAL FISH SPECIES COLLECTED BY OTTER TRAWL AT HUNTINGTON BEACH, 1976-2001

	Year																											Percent
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total	Total
Engraulis mordax	356	3126	2460	6253	186	3138	1	8401	1145	5	61	40	386	11	####	381	3916	####	507	221	826	35	1409	-	628	9	72823	50.205
Genyonemus lineatus	1773	3743	7503	2405	3407	1324	309	1777	1021	890	1200	1017	663	28	239	75	3878	4555	913	780	24	473	103	1	118	390	38609	26.618
Seriphus politus	1822	134	1119	297	1712	2580	529	3968	3058	677	695	303	116	1	602	64	3883	2595	579	654	91	430	199	-	495	125	26728	18.427
Phanerodon furcatus	59	275	148	406	22	378	13	63	4	18	10	4	1	-	1	2	-	9	6	5	-	1	1	-	-	-	1426	0.983
Hyperprosopon argentum	145	254	148	76	76	-	-	33	-	-	-	-	11	-	-	-	1	3	-	-	-	12	1	-	2	20	781	0.538
Paralichthys californicus	7	80	51	12	25	35	72	22	24	40	31	39	52	28	19	25	41	17	11	6	4	13	5	7	1	11	678	0.467
Amphistichus argenteus	18	206	34	167	26	32	-	2	-	1	-	-	-	1	1	-	-	8	-	2	4	1	-	-	6	8	517	0.356
Citharichthys stigmaeus	14	85	5	2	6	-	17	-	-	51	6	67	43	25	40	14	5	8	20	5	21	3	9	18	22	11	497	0.343
Peprilus simillimus	68	1	41	4	13	2	2	137	105	4	15	-	2	-	23	2	12	-	-	5	1	-	38	-	-	-	475	0.327
Cymatogaster aggregata	7	62	41	160	13	78	7	45	-	1	1	-	-	-	3	-	1	4	6	1	2	-	16	-	4	13	465	0.321
Synodus lucioceps	-	5	27	7	-	10	223	1	3	-	3	3	3	39	11	2	31	-	-	1	-	-	9	29	-	21	428	0.295
Pleuronichthys ritteri	-	2	-	2	1	1	12	1	7	11	7	32	21	25	4	20	6	5	2	-	1	-	-	-	-	1	161	0.111
Xystreurys liolepis	-	3	1	2	3	4	32	6	4	18	3	14	9	6	5	12	5	5	1	4	-	-	1	8	1	3	150	0.103
Sardinops sagax	-	-	-	-	-	-	-	-	2	-	-	-	-	-	67	-	7	-	12	-	8	-	46	-	-	-	142	0.098
Leptocottus armatus	-	8	1	-	1	-	-	2	-	38	4	6	49	4	2	-	5	6	2	-	-	1	-	3	6	2	140	0.097
Menticirrhus undulatus	5	3	9	21	2	2	8	8	3	16	8	2	2	-	2	1	3	4	1	-	1	10	14	1	4	-	130	0.090
Anchoa compressa	-	-	-	-	-	1	1	1	1	-	-	-	4	-	-	1	1	10	-	-	-	30	68	-	-	-	118	0.081
Symphurus atricauda	10	11	15	2	1	1	5	3	6	11	8	13	9	4	-	-	-	6	-	-	-	-	-	-	-	-	105	0.072
Syngnathus spp.	5	39	5	2	1	2	4	1	-	-	6	4	14	1	4	-	5	1	1	-	1	-	2	2	-	-	100	0.069
Pleuronichthys verticalis	5	6	16	2	4	5	11	1	1	19	2	9	-	3	-	-	-	1	-	-	-	-	-	9	-	1	95	0.065
Myliobatis californica	-	-	11	8	1	4	1	10	-	11	1	-	-	-	-	1	1	4	-	6	-	5	2	-	18	-	84	0.058
Ophidion scrippsae	1	1	43	-	-	-	-	1	-	1	22	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	71	0.049
Platyrhinoidis triseriata	-	9	-	3	1	-	-	2	1	13	3	10	4	6	-	2	-	1	1	-	1	-	2	-	-	-	59	0.041
Hypsopsetta guttulata	-	1	3	2	3	1	6	6	-	-	2	2	-	2	-	2	-	1	1	-	-	1	-	-	-	2	35	0.024
Paralabrax nebulifer	-	-	1	-	-	-	3	3	3	1	4	1	2	2	2	-	-	1	1	2	-	-	1	1	-	-	28	0.019
Cheilotrema saturnum	-	-	-	-	-	2	-	13	1	2	2	1	-	-	-	-	-	1	3	1	-	-	-	-	-	-	26	0.018
Embiotoca jacksoni	6	-	1	-	-	10	-	-	-	1	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	22	0.015
Rhinobatos productus	2	3	2	1	-	-	-	-	1	-	-	-	1	6	-	-	-	-	-	-	-	-	-	1	1	-	18	0.012
Mustelus henlei	1	3	-	-	-	-	-	-	-	1	-	-	1	1	-	1	1	1	-	-	-	5	-	-	1	-	16	0.011
Heterostichus rostratus	-	1	-	-	-	1	-	-	-	2	1	2	1	-	-	-	-	1	2	-	-	-	1	-	-	-	12	0.008
Porichthys myriaster	-	4	-	-	1	-	-	-	-	-	2	-	1	-	-	1	-	-	-	-	-	-	2	1	-	-	12	0.008
Sphyraena argentea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	4	-	-	-	-	1	-	-	-	-	9	0.006
Atherinopsis californiensis	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	2	1	-	-	1	-	1	1	-	-	-	8	0.006
Squalus acanthias	-	-	-	-	-	-	-	-	-	3	-	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-	8	0.006
Atractoscion nobilis	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	2	-	1	-	6	0.004
Chromis punctipinnis	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2	1	6	0.004
Damalichthys vacca	1	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	6	0.004
Girella nigricans	-	1	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	5	0.003
Paralabrax clathratus	-	-	1	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5	0.003
Microstomus pacificus	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.003
Syngnathus californiensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	4	0.003
Chilara taylori	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.002
Scorpaena guttata	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	3	0.002
Trachurus symmetricus	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3	0.002
Xenistius californiensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3	0.002
Citharichthys xanthostigma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0.001
Leuresthes tenuis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	0.001
Pleuronectes vetulus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0.001
Porichthys notatus	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.001
Sebastes paucispinis	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.001

Table 5.10-4 (CONT'D)
EPIBENTHIS INVERTEBRATES AND FISHES COLLECTED BY TRAWL AT HUNTINGTON BEACH, 1976-2001

	Year																											Percent
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total	Total
Triakis semifasciata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	2	0.001
Anchoa delicatissima	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	0.001
Dorosoma petenense	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Galeorhinus zygopteros	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Gibbonsia elegans	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Halichoeres semicinctus	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Heterodontus francisci	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Hypsoblennius gilberti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	0.001
Pleuronichthys coenosus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	0.001
Pleuronichthys decurrens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	0.001
Raja inornata	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Scomber japonicus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Sebastes serranoides	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Semicossyphus pulcher	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Torpedo californica	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.001
Number of individuals	4309	8068	11693	9834	5508	7613	1256	14513	5392	1836	2102	1572	1402	194	20638	608	11808	26963	2078	1696	986	1031	1933	82	1314	621	145050	
Number of species	21	28	28	22	24	23	19	28	20	25	29	21	26	19	20	18	21	25	23	17	14	21	23	13	17	17	65	
Number of stations sampled	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6	6	6	6	6	6	6	6		

Source: MBC, 2001

- The area does not have any "environmentally sensitive" habitats such as eel grass beds, surf grass, rocky shores, or kelp beds; and
- The movement, abundance, and diversity of invertebrate and fish populations along the Huntington Beach coast appear all to be in response to natural ecological factors and not in any way influenced or affected by the HBGS discharge.

REGULATORY FRAMEWORK

California Ocean Plan

Since 1973, the California State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (RWQCB) have been delegated the responsibility for administering permitted discharge into the coastal marine waters in California. The SWRCB prepares and adopts the Quality Control Plan for Waters of California (Ocean Plan), which incorporates the water quality control standards that apply to all NPDES permits.

The SWRCB adopted the Ocean Plan on July 6, 1972. Since 1972, the Ocean Plan has been amended a number of times, most recently in 2001. The Ocean Plan establishes beneficial uses to be protected, water quality objectives and a program for implementation needed for achieving the water quality objectives. The beneficial uses of the ocean protected by the Ocean Plan include: preservation and enhancement of designated Areas of Special Biological Significance (ASBS); rare and endangered species; marine habitat; fish migration; fish spawning; shellfish harvesting; recreation; commercial and sport fishing; mariculture; industrial water supply; aesthetic enjoyment; and navigation. The Ocean Plan's water quality objectives for California's ocean waters and provide basis for regulation of wastes discharged into the State's coastal waters. When a discharge permit is written, the water quality objectives defined in the Ocean Plan are converted into effluent limitations that apply to discharges into State ocean waters. These effluent limitations are established on a discharge-specific basis depending on the initial dilution calculated for the facility discharge outfall. The regulatory agency with jurisdiction over the discharge from the Huntington Beach seawater desalination facility would be the SARWQCB. The Ocean Plan's narrative and numerical water quality objectives are based on bacterial, physical, chemical, and biological characteristics as well as radioactivity. The water quality objectives in the Ocean Plan are established for protection of human health from both carcinogens and non-carcinogens. Within the Ocean Plan there are 21 objectives for protecting aquatic life, 20 for protecting human health from non-carcinogens, and 42 for protecting human health from exposure to carcinogens.

The numeric objectives of the 2001 California Ocean Plan, Table B, would apply to discharges from the proposed desalination facility (objectives currently apply to discharges from the AES power plant), and would be evaluated by the Regional Water Quality Control Board as part of the NPDES permit for the project. The NPDES permit (No. CA0001163) issued to AES Huntington Beach, LLC by the SARWQCB includes specific monitoring requirements for monitoring the discharges through the outfall. Those requirements would continue to apply. In addition, the project would be required to obtain a separate NPDES permit from the SARWQCB that would also include monitoring requirements. The RWQCB's Ocean Plan human health standards are designed to protect the beneficial use of body-contact recreation. The discharge from the desalination facility would be required to meet all Ocean Plan standards regulated by the SARWQCB.

Based on the Water Quality Management Plan (WQMP) for the Santa Ana River Basin, the Pacific Ocean's nearshore waters in the project site vicinity serve multiple beneficial uses. Existing beneficial uses within the coastal vicinity include: industrial service supply, navigation, contact water recreation (swimming, diving), non-contact water recreation (sailing, tide pool studies, aesthetic enjoyment, etc.), commercial and sport fishing, wildlife habitat support, rare/threatened/endangered species habitat support, spawning/reproduction/development habitat support, marine habitat, and shellfish harvesting. No "potential uses" for the project vicinity (as categorized within the WQMP) have been recorded.

This project does not require that the Pacific Ocean in the vicinity of the intake be designated as supporting the beneficial use of drinking water (MUN). The Sources of Drinking Water Policy, adopted by the State Water Resources Control Board in 1988, requires that all waters of the state, with certain exceptions, be protected as existing or potential sources of municipal and domestic supply. One of the exceptions is water with a total dissolved solids (TDS) concentration exceeding 3,000 mg/L, which is applicable to the Pacific Ocean. The MUN designation affords some additional chemical protection of a waterway because maximum contaminant levels (MCLs) are to be achieved in ambient waters. There is no additional protection provided for microbial contaminants because MCLs have not been established for pathogens or coliforms.

The Pacific Ocean in the vicinity of the intake is high quality and, in fact, has concentrations of some chemicals that are far below the drinking water MCLs prior to any treatment. An MUN designation would not provide any additional protection because the intake water quality is not influenced by storm water discharges, the Santa Ana River, the Talbert Marsh, or the Orange County Sanitation District (OCSD) wastewater discharge, as described in the hydrologic modeling studies included in Appendix C, *HYDRODYNAMIC MODELING REPORT*. Requiring these discharges to meet MCLs in ambient waters would provide no improvement in water quality at the intake to the desalination facility.

Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan)

The State Water Resources Control Board's Thermal Plan regulates the discharges of elevated temperature wastes (thermal discharges) into coastal waters of California. The main purpose of this plan is to assure protection of the beneficial uses and areas of special biological significances from excessive thermal discharges. A key plan objective is to reduce the overall amount of thermal load discharged in State waters, including coastal waters.

The Thermal Plan limits the maximum temperature of thermal discharge to Coastal Waters to 20 degrees Fahrenheit over the ambient ocean water temperature. This plan also requires the discharge of elevated wastes to the ocean not to cause a temperature increase in the natural water by more than 4 degrees Fahrenheit at: (a) the shoreline, (b) the surface of any ocean substrate, or (c) the ocean surface beyond 1,000 feet from the discharge system. The surface temperature limitation is to be maintained at least 50 percent of the duration of any tidal cycle.

SARWQCB Water Quality Control Plan (Basin Plan)

The California Ocean Plan, the Thermal Plan and other plans and policies adopted by the SWRCB are incorporated into the Basin Plan. A revised Basin Plan for the Santa Ana region became effective on January 24, 1995. In 2004, the Basin Plan was amended. This plan specifies beneficial uses and water quality objectives for waters in the "Nearshore Zone" and "Offshore Zone" of the Pacific Ocean in the Santa Ana region.

The "Nearshore Zone" is defined by the Ocean Plan, Chapter II, A.1 as "a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline". The "Offshore Zone" is the area bounded between by the "Nearshore Zone" and the limit of the State waters.

<u>NPDES Permit</u>

To comply with regulatory requirements the applicant applied to the SARWQCB for a NPDES permit on May 15, 2003. The NPDES permit application included:

- Submission of an application;
- Submission of an Engineering Report including;
    - Facility Description;
    - Facility Waste Streams;
    - Waste Streams Characterizations;
    - California Ocean Plan Requirements; and
    - Antidegradation policy Applicability.

It is expected that the SARWQCB may include provisions in the NPDES permit pertaining to the following:

- Discharge Water Quality Limits; and
- Water Quality Monitoring and Reporting.

In summary, through issuance of a NPDES permit for the proposed project, the SARWQCB would require that the objectives for marine water quality as defined in the California Ocean Plan, Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California, and SARWQCB Basin Plan that would apply to the proposed project include:

˜ **Bacterial Characteristics:** Samples of water from each sampling station shall have a density of total coliform less than 1,000 per 100 ml (10 per ml), provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 per 100 ml (10 per ml), and provided further that no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 per 100 ml (100 per ml). In addition, the fecal coliform density based on a minimum of not less than five samples for any 30-day period, shall not exceed a geometric mean of 200 per 100 ml nor shall more than 10 percent of the total samples during any 60-day period exceed 400 per 100 ml. For all areas where shellfish may be harvested for human consumption, as determined by the Regional Board, the median total coliform density shall not exceed 70 per 100 ml, and not more than 10 percent of the samples shall exceed 230 per 100 ml.

˜ **Physical characteristics:** Ocean waters shall be free of visible floating particulates, grease, oil, and discoloration. Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste. In addition, the rate of deposition of inert solids and the characteristics of inert solids in ocean sediments shall not be changed such that benthic communities are degraded.

˜ **Chemical Characteristics:** The dissolved oxygen concentration shall not at any time be depressed more than 10 percent from that which occurs naturally as a result of the discharge of oxygen demanding waste materials, while the pH shall not be changed at any time more than 0.2 units from that which occurs naturally. In addition, the amounts of dissolved sulfide, nutrient materials, and harmful substances in marine sediments shall be limited so as not to negatively impact marine life.

- **Biological Characteristics:** Marine communities, including vertebrate, invertebrate, and plant species shall not be degraded. In addition, the natural taste, odor, and color of marine resources used for human consumption shall not be altered, nor shall the concentration of organic materials bioaccumulate to levels that are harmful to human health.

- **Radioactivity:** Discharge of radioactive waste shall not degrade marine life.

IMPACTS

Significance Criteria

Based on the CEQA Guidelines, Appendix G, the project would have a significant effect related to water quality if it would:

- Violate any water quality standard or waste discharge requirements;
- Otherwise substantially degrade water quality.

The significance thresholds for biological resources that are identified in Appendix G of the CEQA Guidelines are applicable primarily to terrestrial biological resources. With respect to marine biological resources, guidance in developing appropriate significance thresholds has been taken from the California Coastal Commission (CCC) because the CCC must consider potential impacts of the proposed project before issuing the necessary Coastal Development Permit. In a recent report, dated March 2004, and updated September 2004, the CCC indicated concerns about potential impacts on the marine environment resulting from seawater desalination. The stated concerns in this report are:

- Increased salinity of the effluent;
- Potential detrimental effects from chemicals added to the seawater during the desalination process; and
- Potential for impingement and entrainment in the intake system to degrade the quality of assemblages in the local or regional marine environment.

These generalized concerns encompass the range of potential effects of the desalination facility on ocean water quality and marine organisms, and therefore are the primary focus of this Recirculated EIR for determination of significant effects of the project.

Elevated Salinity

EPA (1986) policy on discharge effects related to salinity acknowledges that fishes and other aquatic organisms are naturally tolerant of a range of dissolved solids concentrations (in this case salinity) and must be able to do this in order to survive under natural conditions. Also, marine species do exhibit variation in their ability to tolerate salinity changes. EPA (1986) recommendations state that, to protect wildlife habitats, salinity variation from natural levels should not exceed 4 ppt when natural salinity is between 13.5 and 35 ppt. The average ocean salinity at Huntington Beach and over a vast expanse of ocean area around it is 33.5 ppt. As applied to the proposed project, discharge scenarios that do not permanently elevate salinities to 37.5 ppt (a 12 percent increase) or greater outside of a reasonable distance from the discharge core would appear effective in not adversely affecting marine organisms.

The study prepared by Dr. Graham (Appendix S) specifically addressed potential effects on local species passing through the area surrounding the discharge core, as well as the potential effects on bethnic organisms living in the area surrounding the discharge core. The study incorporates numerous references and examples where no substantial ecological losses to source populations of marine organisms were observed from short-term exposure to elevated salinity levels.

Based on the results of the referenced studies the following threshold for significant impacts on marine organisms from elevated salinity was defined for the site-specific conditions of the Huntington Beach project:

- Significant impacts related to elevated salinity would occur if the project would discharge salinity levels that result in substantial ecological losses to source populations of marine organisms; and/or
- Permanent elevation of salinity levels to 37.5 ppt or greater outside of a reasonable distance from the discharge core would be significant.

Chemical Discharge

Significant impacts related to chemical discharge would occur if the project would discharge any chemical wastes that would result in substantial ecological losses to source populations of marine organisms.

Impingement and Entrainment

Effects related to impingement and entrainment would be considered significant if:

- The impingement effects (trapping of larger organisms on intake screens) of desalination facility operations result in substantial ecological losses to source populations of the impinged species; and/or
- The entrainment effects (loss of small planktonic organisms passing through cooling water system) of desalination facility operations result in substantial ecological losses to source populations of the entrained species.

OCEAN WATER QUALITY

Oceanographers from the Scripps Institution of Oceanography conducted modeling studies using a computer model that simulates ocean conditions near the HBGS intake and outfall (refer to Appendix C,*HYDRODYNAMIC MODELING REPORT*). The model calculates the degree of mixing of various potential contaminant sources with the Pacific Ocean. The Santa Ana River, Talbert Marsh, OCSD wastewater discharge outfall, HBGS discharge and proposed desalination facility discharge were all investigated. Seawater contamination resulting from any of the above sources could potentially impact the quality of desalinated product water and, to some degree, the quality of byproduct concentrated seawater water to be discharged from the HBGS outfall. The model results show the amount of dilution of each of these sources of pollutants under different oceanographic conditions.

The modelers from Scripps used their many years of experience working along the Southern California coast to determine the "worst case" conditions that would be modeled. The "worst case" conditions were chosen to determine if any adverse water quality or environmental impacts occurred under extreme ocean and weather conditions that were most likely to show an effect. For example, the effect of the Santa Ana River and Talbert Marsh storm water on water quality at the HBGS intake was modeled assuming a very large, prolonged storm event and ocean currents flowing from the mouth of the river towards the HBGS facility. Normally, ocean currents flow in the opposite direction, down the coast (southeast) away from the HBGS.

Potential Sources of Contamination in Proximity to the HBGS Intake

<u>OCSD Wastewater Discharge</u>

As stated above, the OCSD sewage treatment facility discharges a mix of primary and secondary treated wastewater at an outfall located 4.5 miles offshore at a depth of 195 feet. However, it should be noted that OCSD has committed to provide secondary treatment for 100 percent of all effluent it receives. The development of facilities to provide this additional secondary treatment could take up to 11 years to plan, design, construct, and commission. A more detailed implementation plan is being developed by the District.

In addition, on August 12, 2002, the OCSD began disinfecting its wastewater per RWQCB requirements. The OCSD is presently adding bleach as a disinfectant followed by sodium bisulfite to remove residual prior to ocean discharge, and will continue to do so for the next three to five years. Testing and studies are underway to evaluate other disinfection technologies, including ultraviolet light, ozone, and peracetic acid for long-term application.

The OCSD wastewater discharge would have the greatest potential to impact water quality at the HBGS intake with summer El Nino conditions when currents are flowing northwest towards the HBGS. In addition, for worst case conditions, the model assumed that:

- OCSD was discharging at its maximum allowable rate of 480 mgd;
- The temperature conditions in the ocean would allow the wastewater plume to be near the depth of the HBGS intake;
- A current would travel upcoast (northwest);
- End of pipe total coliform counts would be at the mid- to high end of operational ranges prior to OCSD disinfection resolution; and
- HBGS would operate at a maxium flow rate and intake velocity (507 mgd and two feet per second, respectively).

It should be noted that these conditions are atypical and the likelihood of them occurring simultaneously is extremely low.

The worst case model results show that the OCSD discharge is diluted 30 million to one at the HBGS intake. Any contaminants discharged at the OCSD outfall would be diluted far below background levels at the intake to the HBGS. Therefore, the OCSD discharge was not found to be a significant source of contamination at the HBGS intake.

Furthermore, the proposed desalination project discharge is not expected to have a measurable impact on the OCSD's wastewater treatment plant effluent water quality, and therefore will not require changes to OCSD's monitoring program or additional monitoring in the currently monitored area. According to hydrodynamic modeling prepared for the project, the "low flow" scenario ocean water salinity increases as a result of the desalination facility discharge, and discharge salinity concentration will diminish to levels close to the background ocean water salinity of 33.6 ppt before it reaches the OCSD outfall and monitoring area. The accuracy of the currently available instrumentation for seawater salinity measurement is +/- 0.1 ppt. Under the "low flow" scenario the discharge salinity concentration of the desalination facility discharge decreases to 33.6 ppt (within + 0.1 ppt of the background seawater concentration of 33.5 ppt in less than 2,000 feet from the desalination facility point of discharge. The OCSD discharge outfall is more than five miles (26,400 feet) away from the power plant outfall. By the time the desalination facility discharge reaches the OCSD monitoring area, the salinity change contributed to the desalination facility discharge will be within the range of natural variability, and therefore, will be non-detectible. Refer to Appendix C, *HYDRODYNAMIC MODELING REPORT* for additional information.

As far as other constituents of concern for the OCSD discharge, the desalination facility discharge water quality would be well within the limits established in the Ocean Plan. Therefore, the desalination facility discharge is not expected to have any measurable effect on the results of the OCSD's monitoring program.

<u>Urban Storm Water Runoff</u>

The Santa Ana River drains a highly urbanized watershed of 1,700 square miles and flows into the ocean approximately 8,300 feet southeast from the intake to the AES facility. The Talbert Marsh, which receives urban runoff from the City of Huntington Beach and several other communities, discharges to the ocean about 7,000 feet southeast from the AES intake. Under typical conditions, the discharges from the Santa Ana River and Talbert Marsh flow away (southeast) from the AES intake. However, there are times when the currents flow northwest and carry river and marsh water towards the AES facility. Since freshwater is less dense than seawater, the river and marsh discharges normally float on the surface of the sea and are slowly mixed into deeper waters. During storms, winds and waves can mix the river and marsh plumes into deeper water more rapidly.

Storm water discharges from the Santa Ana River and Talbert Marsh would have the greatest potential to impact water quality at the HBGS intake if an extreme storm event coincided with an El Nino winter and maximum pumping of cooling water into the generating station. Although it is unlikely that all of these events would coincide with one another, this was considered to be the "worst-case" scenario for determining if the Santa Ana River and Talbert Marsh contribute contaminants to the HBGS intake.

The model results show that during a 24-hour extreme runoff period only 0.0003 percent of the water at the HBGS intake would come from the Santa Ana River and Talbert Marsh and the remaining 99.9997 percent would be seawater. These results show that contaminants are not transported to the HBGS intake from the Santa Ana River and Talbert Marsh during extreme storm conditions. More detailed modeling results are presented in Appendix C, *HYDRODYNAMIC MODELING REPORT*. Impacts are not anticipated to be significant in this regard.

<u>Dry Weather Runoff</u>

The mouth of the Talbert Marsh is closed by sand spits for short periods of time during the dry season. This can trap up to 200 million gallons of urban runoff and seawater in the Marsh and lower channel system. When very high tides rise over the sand spit, the mouth of the Talbert Marsh opens and 80 to 100 million gallons of water can be released into near shore ocean waters in a single tidal flush. Because Talbert Marsh waters are similar to seawater salinity in the dry season, the discharge does not float on the sea surface and may quickly mix into deeper ocean waters where the HBGS intake is located.

Tidal flushing of the Talbert Marsh would have the greatest potential to impact water quality at the HBGS intake during high spring tides combined with summer El Nino conditions when currents are flowing northwest from the marsh towards the intake. The model showed that under these worst case conditions, the marsh water is diluted 20,000 to one and essentially does not reach the intake. This is due to the fact that the marsh water is released into the surf zone and the onshore waves keep the marsh water in the shallow nearshore waters, whereas the HBGS intake is located 1,840 feet offshore at a depth of approximately 33 feet. Impacts are not anticipated to be significant in this regard.

Recirculation of HBGS Discharge

The HBGS outfall is located approximately 1,500 feet offshore and 340 feet from the HBGS intake. The potential for recirculation of the discharge into the intake was examined. The discharge consists primarily of cooling water, but a small amount of power plant process wastewater and storm water can be mixed with the cooling water. The concentrated seawater from the proposed desalination facility will also be mixed with the power plant cooling water.

Recirculation of the HBGS discharge would have the greatest potential to impact water quality at the intake during El Nino storm conditions when the maximum amount of storm water is being discharged through the outfall. The hydrodynamic model for recirculation of the HBGS discharge was run using the El Nino conditions of February 1998 and the maximum allowable discharge of 1.66 MGD of generating station process wastewater and storm water. In addition, the proposed desalination facility was assumed to be running at full capacity so that 50 MGD of concentrated seawater discharge was mixed with the cooling water discharge. Furthermore, recirculation potential was examined under two generating scenarios: 1) one generating unit on-line with a total discharge of 78.4 MGD of cooling water, storm water, and wastewater, and the concentrated seawater discharge and 2) four generating units on-line producing a total discharge of 458.6 MGD of cooling water, storm water, and wastewater, and the concentrated seawater discharge. The model results under worst case conditions for a 7-day extreme runoff period show that only 0.3 percent of the HBGS discharge would be recirculated to the intake. The results for four generating units show a greater dilution with only 0.1 percent of the HBGS discharge recirculated to the intake. Based on these results, the recirculation of the HBGS discharge during storm events has been shown to not affect the source water quality at the HBGS intake. Impacts are not anticipated to be significant in this regard.

Los Angeles and San Gabriel Rivers

As stated above, the Los Angeles River discharges to the ocean approximately 16 miles upcoast (i.e. northwest) from HBGS, while the San Gabriel River discharges approximately 11 miles upcoast. The amount of dilution that occurs and the fact that the generating station intake is at a depth of approximately 33 feet indicates that contaminants entering the ocean from these two rivers would not likely affect the water quality at the HBGS intake. Impacts in this regard are not anticipated to be significant.

Cruise Ships and Fishing Boats

The nearest major port for cruise ships is located approximately 16 miles northwest of the HBGS intake. Ingress/egress routes for cruise ships for Long Beach and Los Angeles Harbors do not come in close proximity to the HBGS. In addition, given the limited nature of sportfishing that occurs in the project site vicinity, impacts in this regard are not anticipated to be significant.

Recreation

Any contaminants released into the ocean due to recreational use are likely to be small in quantity greatly diluted due to tidal action. It would be difficult for such contaminants to reach the HBGS intake due to its depth of approximately 33 feet below the ocean surface. Impacts in regards to recreational uses are not anticipated to be significant.

Oil and Gas Production Facilities

As stated above, there are two offshore oil platforms approximately 1.5 miles west of the HBGS intake and four platforms approximately 10 miles west of the intake. There have not been any reportable spills or leaks from the offshore oil platforms or the pipelines. A catastrophic event at one of the offshore platforms that is near the coast could affect water quality at the HBGS intake. However, given the relatively low probability based on operational history, impacts in this regard are not anticipated to be significant.

Red Tides and Algal Toxins

Refer to Section 5.11, *PRODUCT WATER QUALITY* for a discussion of potential impacts in regards to red tides and algal toxins.

Operations at HBGS

Activities or conditions occurring along the HBGS cooling water system between the HBGS intake and the point at which water is diverted toward the desalination facility could impact water quality (particularly in regards to metals). The diversion point would occur after cooling water has traveled through the HBGS condensers.

There are numerous water quality constituents regulated in drinking water supplies. Samples were collected from the HBGS intake vault and from the outlet of the condensers (where the desalination facility intake will be located). Table 5.10-5a/b, *COMPARISON OF HBGS INTAKE WELL MONITORING TO PRIMARY MAXIMUM CONTAMINANT LEVELS* compares the intake data to the California Department of Health Services (DHS) primary MCLs. Table 5.10-6a/b, *COMPARISON OF INTAKE WELL MONITORING TO SECONDARY MAXIMUM CONTAMINANT LEVELS* compares the data to the secondary MCLs. Although MCLs apply to treated drinking water, raw water concentrations that exceed MCLs provide an indication of potential contaminants of concern. None of the primary MCLs are exceeded in the intake water and the only secondary MCLs that are exceeded are salts (TDS, chloride, sulfate) that would be removed by the reverse osmosis process. Impacts are not anticipated to be significant in this regard.

Potential sources of contaminants at the HBGS site also include cycle water, storm water, and wastewater that are mixed with the cooling water, and on-site spills of hazardous materials of sufficient magnitude to enter the floor drainage system or yard storm drainage system. These potential contaminants are discussed in more detail in Appendix E, *WATERSHED SANITARY SURVEY.*

Cycle Water Discharges

Cycle water is discharged to the cooling water system at various locations as the cooling water flows through the generating station. The cycle water is under vacuum so the cooling water leaks into the cycle water but the cycle water does not leak into the cooling water. There are several locations where cycle water is discharged into the cooling water system. Table 5.10-7, *CYCLE WATER DISCHARGES TO THE HBGS COOLING WATER SYSTEM* presents a summary of the discharges to the cooling water system that will be upstream of the intake to the desalination facility. The contaminants in these discharges will be greatly diluted by the large volume of cooling water compared to the small volume of the discharges. The only chemical of concern in a drinking water source is nitrite. The other chemicals in the discharges are not toxic to humans and drinking water standards have not been established. Because the volume of cooling water represents a maximum of 0.002 percent of the cooling water flowing through one unit at the HBGS, the nitrite concentration

Table 5.10-5a
COMPARISON OF HBGS INTAKE WELL MONITORING DATA TO PRIMARY MAXIMUM CONTAMINANT LEVELS

Constituent	Primary Maximum Contaminant Level	Monitoring Data		
		Number of Samples	Mean Concentration	Maximum Concentration
Inorganic Chemicals				
Aluminum, mg/L	1	3	0.063	0.073
Antimony, mg/L	0.006	3	0.00009	0.00013
Arsenic, mg/L	0.05	3	0.002	0.003
Asbestos, MFL	7			
Barium, mg/L	1	14	<0.000001	<0.000001
Beryllium, mg/L	0.004	3	<0.000005	<0.000005
Cadmium, mg/L	0.005	4	0.00003	0.0001
Chromium, mg/L	0.05	4	0.002	0.003
Copper, mg/L	1.3	4	0.0005	0.0008
Cyanide, mg/L	0.2	2	<0.001	<0.001
Fluoride, mg/L	2	14	0.724	0.9
Lead, mg/L	0.015	4	0.0001	0.0002
Mercury, mg/L	0.002	4	<0.0001	<0.0001
Nickel, mg/L	0.1	5	0.001	0.002
Nitrate, mg/L as N	10	14	<0.1	<0.1
Nitrate + Nitrite, mg/L as N	10			
Nitrite, mg/L as N	1			
Selenium, mg/L	0.05	3	0.005	0.008
Thallium, mg/L	0.002	3	0.00004	0.00006
Radioactivity				
Gross alpha particle, pCi/L	15	3	3.62	6.62
Gross beta particle, pCi/L	50	2	14.15	23.4
Radium 226 & 228, pCi/L	5	1	0.226	
Radium 226, pCi/L				
Radium 228, pCi/L				
Strontium-90, pCi/L	8			
Tritium, pCi/L	20,000			
Uranium, pCi/L	20			
Organic Chemicals				
Atrazine, mg/L	0.003	1		<0.010
Benzo(a)pyrene, mg/L	0.0002	1		<0.001
Carbofuran, mg/L	0.018	1		<0.050
Di(2-ethylhexyl)pthlate, mg/L	0.004	1		<0.030
Endothall, mg/L	0.100	1		<0.400
Simazine,mg/L	0.004	1		<0.010
2,3,7,8 – TCDD, pg/L	0.003	1		<1.69

Note: August 2001 – November 2001 data as per sanitary survey approved by DHS August 2002.

Table 5.10-5b
COMPARISON OF HBGS INTAKE WELL MONITORING DATA TO PRIMARY MAXIMUM CONTAMINANT LEVELS

Constituent	Primary Maximum Contaminant Level	Monitoring Data		
		Number of Samples	Mean Concentration	Maximum Concentration
Inorganic Chemicals				
Aluminum, mg/L	1	8	0.204	0.496
Antimony, mg/L	0.006	8	0.00011	0.00014
Arsenic, mg/L	0.05	8	0.0016	0.0025
Barium, mg/L	1	14	<0.000001	<0.000001
Beryllium, mg/L	0.004	8	<0.000004	<0.00002
Cadmium, mg/L	0.005	8	0.00004	0.0003
Chromium, mg/L	0.05	8	0.0013	0.0048
Copper, mg/L	1.3	8	0.0011	0.002
Cyanide, mg/L	0.2	4	<0.001	<0.001
Fluoride, mg/L	2	4	1.6	1.9
Lead, mg/L	0.015	8	0.0002	0.0004
Mercury, mg/L	0.002	8	0.00002	0.00005
Nickel, mg/L	0.1	8	0.0029	0.0085
Nitrate, mg/L as N	10	14	<0.1	<0.1
Nitrite, mg/L as N	1	1	<0.6	<0.6
Nitrite + Nitrate, mg/L as N	10	1	<0.6	<0.6
Selenium, mg/L	0.05	8	0.00003	0.00005
Thallium, mg/L	0.002	8	0.000011	0.000025
Radioactivity				
Gross alpha particle, pCi/L	15	3	3.62	6.62
Gross beta particle, pCi/L	50	2	14.15	23.4
Radium 226 & 228, pCi/L	5	1	0.226	0.226
Strontium-90, pCi/L	8	1	< 2	< 2
Tritium, pCi/L	20,000	1	24.6	24.6
Uranium, pCi/L	20	1	1.64	1.64
Organic Chemicals				
Atrazine, mg/L	0.003	1	<0.010	<0.010
Benzo(a)pyrene, mg/L	0.0002	4	<0.000001	<0.000001
Carbofuran, mg/L	0.018	1	<0.050	<0.050
Di(2-ethylhexyl)pthlate, mg/L	0.004	1	<0.030	<0.030
Endothall, mg/L	0.100	1	<0.400	<0.400
Simazine,mg/L	0.004	1	<0.010	<0.010
2,3,7,8 – TCDD, pg/L	0.003	1	<1.69	<1.69

Note: Nov. 2001-Dec 2002 water quality data collected for the desalination facility design and operation criteria.

of 800 mg/L will be diluted to about 0.02 mg/L in the cooling water that would reach the desalination facility. This level of nitrite is well below the drinking water MCL of one mg/L. Nitrite and the other chemicals present in the cycle water discharges will easily be removed by the reverse osmosis membranes. As a result, impacts in this regard are not anticipated to be significant.

Urban Runoff Discharges

Storm runoff from the HBGS site and a limited amount of off-site urban runoff is currently discharged to the cooling water system upstream of the intake to the desalination facility.

The applicant would coordinate with HBGS to reroute these discharges during construction of the desalination facility so they would be downstream of the desalination intake and not

Table 5.10-6a
COMPARISON OF HBGS INTAKE WELL MONITORING DATA TO SECONDARY MAXIMUM CONTAMINANT LEVELS

Constituent	Secondary Maximum Contaminant Level	Monitoring Data		
		Number of Samples	Mean Concentration	Maximum Concentration
Aluminum, mg/L	0.2	3	0.063	0.073
Color, units	15			
Copper, mg/L	1.0	4	0.0005	0.0008
Corrosivity	Non corrosive			
MBAS, mg/L	0.5			
Iron, mg/L	0.3	3	0.051	0.081
Manganese, mg/L	0.05	3	0.006	0.009
MTBE, mg/L	0.005	2	<0.002	<0.003
Threshold Odor Number, units	3			
Silver, mg/L	0.1	4	0.0003	0.0006
Thiobencarb, mg/L	0.001	1		<0.010
Turbidity, units	5	27	3.9	16
Zinc, mg/L	5.0	3	0.006	0.008
Total dissolved solids, mg/L	500	26	33,100	39,100
Conductance, umhos/cm	900	24	48,400	49,200
Chloride, mg/L	250	14	19,600	20,200
Sulfate, mg/L	250	14	2,300	2,700

Note: August 2001 – November 2001 data as per sanitary survey approved by DHS August 2002.

Table 5.10-6b
COMPARISON OF HBGS INTAKE WELL MONITORING DATA TO SECONDARY MAXIMUM CONTAMINANT LEVELS

Constituent	Secondary Maximum Contaminant Level	Poseidon Monitoring Data		
		Number of Samples	Mean Concentration	Maximum Concentration
Aluminum, mg/L	0.2	3	0.063	0.073
Color, units	15	1	3	3
Copper, mg/L	1.0	4	0.0005	0.0008
Corrosivity	Non corrosive	NA	NA	NA
MBAS, mg/L	0.5	1	0.065	0.065
Iron, mg/L	0.3	3	0.051	0.081
Manganese, mg/L	0.05	3	0.006	0.009
MTBE, mg/L	0.005	2	<0.002	<0.003
Threshold Odor Number, units	3	4	1	1
Silver, mg/L	0.1	4	0.0003	0.0006
Thiobencarb, mg/L	0.001	1		<0.010
Turbidity, units	5	27	3.9	16
Zinc, mg/L	5.0	8	0.0029	0.0058
Total dissolved solids, mg/L	500	26	33,500	34,340
Conductance, umhos/cm	900	24	48,400	49,200
Chloride, mg/L	250	14	19,600	20,200

Sulfate, mg/L	250	14	2,300	2,700

NA – Not Applicable
Note: Nov 2001 – Dec 2002 water quality data collected for desalination facility design and operation criteria.

Table 5.10-7
CYCLE WATER DISCHARGES TO THE HBGS COOLING WATER SYSTEM

Discharge	Volume	Contaminants
Condensate Overboard	25,000 gallons per unit at start-up, generally once per month.	Chloride - 1-5 mg/L Ammonia - 0.15-0.5 mg/L Silica – 1 mg/L Iron – 1-5 mg/L Copper – 1 mg/L pH – 7.0-8.5
Boiler Blowdown	25,000 gallons per day from each unit.	Chloride – 1-9 mg/L Phosphate – 0.5-10 mg/L Silica – 0.135-0.25 mg/L Iron – 1 mg/L Copper – 1 mg/L pH – 9.15-11 EC – 10-300 umhos/cm Sodium hydroxide – 1-40 mg/L
Bearing Cooling Water Exchanges	Several 1,000 gallons per day from each unit.	Nitrite – 600-800 mg/L EC – 6,000 umhos/cm pH – 8.5 Hardness – 10 mg/L as CaCO3 Sodium fluorescein dye – 1-10 mg/L Polyoxyethylene-polyoxypropylene copolymer Ethoxylated nonylphenol Polydimethysiloxane Isothiazolin Uranine dye – 2-10 mg/L

affect water quality at the desalination intake. The off-site urban runoff is from approximately 70 acres of land near the HBGS. The off-site drainage comes from a road and mobile home/recreational vehicle park to the west, the Wildlife Care Center parking lot located to the south, and a small commercial area north of the site. Dry weather runoff collects in a ditch alongside Newland Street and is currently pumped into the HBGS outfall pipeline. The City of Huntington Beach plans to modify the system so that it flows into the HBGS site by gravity when improvements are made to Newland Street as part of the conditions placed upon the project by the City of Huntington Beach. Impacts are not anticipated to be significant in this regard.

Wastewater Discharges

Low volume wastes, metal cleaning wastes, and pipeline hydrostatic test water are diverted to the HBGS retention basin and then to the outfall, where the wastewater is mixed with cooling water. Currently this waste is discharged downstream of the intake to the desalination facility and would not be included in the source water for the proposed desalination facility. As a result, impacts in this regard are not anticipated to be significant.

Hazardous Materials Spills

A number of petroleum products and other hazardous materials are stored and used at the generating station. Although unlikely due to spill prevention measures and clean-up procedures in place at the HBGS, there is the potential for a spill to reach the floor drain or the storm drainage system and enter the cooling water system. The floor and yard drainage system currently enters the outfall line downstream of the point where the desalination facility will be located and would not be included in the desalination facility's source water. As a result, impacts in this regard are not anticipated to be significant.

Heat Treatments

Periodically water from the discharge vault is diverted back into the facility and reheated. This reheated water is then used to clean the discharge line of biological growths ("bio-film"). This recirculated water contains wastes that have been discharged to the discharge vault prior to the flow being reversed in the facility. The proposed desalination facility would not intake water from the HBGS cooling water system during heat treatments. As a result, impacts in this regard are not anticipated to be significant.

<u>Elevated Bacteria Levels in the Huntington Beach Surf Zone</u>

As stated above, extensive bacterial studies have shown that the Santa Ana River and Talbert Marsh appear to be the primary sources of fecal indicator bacteria to the near shore ocean. In addition, bird droppings and a reservoir of bacteria stored in the sediment and on marine vegetation may continue to be the source of bacteria at the mouths of the river and marsh. Modeling studies and monitoring data indicate that there is likely another unidentified source of bacteria in the vicinity of Stations 6N and 9N. However, three separate studies conducted between 2001 and 2002 have demonstrated that HBGS is not the source of bacteria in the surf zone.

As discussed previously, the results of hydrodynamic modeling performed for the EIR show that contaminants are not transported to the HBGS intake from the Santa Ana River and Talbert Marsh during extreme storm event conditions. In addition, dry weather urban runoff at Talbert Marsh during tidal flushing essentially does not reach the HBGS intake. Although the cause of the elevated bacteria levels in the Huntington Beach surf zone has not been determined, the seawater desalination process would have the ability to remove bacteria and produce potable water meeting all State Title 22 standards. The treatment process and product water quality impacts are further discussed in Section 5.11, *PRODUCT WATER QUALITY.* Impacts in this regard are not anticipated to be significant.

MARINE BIOLOGY

Concentrated Seawater Discharge

Implementation of the proposed desalination project would mix the facility's concentrated seawater discharge with the HBGS cooling water discharge. It should be noted that, in addition to a Coastal Development Permit (CDP) required by the City for the proposed desalination project, a separate CDP will be required by the California Coastal Commission for the changes in HBGS outfall salinity. In-pipe salinity of the combined concentrated seawater/cooling water discharge water will depend upon the level of operation of the HBGS facility.

Following ocean discharge, the combined effluent will mix rapidly with oceanic water. The orientation of the outfall structure produces a vertical discharge stream, which broaches the sea surface as an observable "boil", and promotes mixing. The denser, high-salinity water will subsequently sink to the bottom, and then spread outward from the base of the outfall tower, further mixing with the surrounding water.

Hydrodynamic modeling of water mass dilution and dispersion (included as Appendix C, *HYDRODYNAMIC MODELING REPORT*) utilized the SEDXPORT model, developed at Scripps Institution of Oceanography for the U.S. Navy's Coastal Water Clarity Program. It has been thoroughly peer reviewed (including peer review by Dr. Stanley Grant, Professor at University of California, Irvine), and has been extensively calibrated and validated in numerous applications throughout the Southern California Bight. The model studied the ocean response to the proposed 50 mgd desalination facility using two separate modeling approaches: 1) event analyses of theoretical extreme cases, and 2) continuous long term simulations using the historical sequence ocean and HBGS operating variables. The latter approach was applied to two distinct historical periods: 1) resulting in 7,523 modeled solutions between 1980 and mid 2000; and 2) involving 578 modeled solutions that characterized the post re-powering period using data collected between January 1, 2002 and July 30, 2003.

The event analysis involved some potential situations for operating the desalination facility when the generating station is operating at very low pumping levels. It refers to these as *"low flow cases"* and they produce the highest in-the-pipe concentrations of sea salts from the desalination process. The most common low flow case occurs when two circulating pumps are running and one of the four generating units is in operation. The most extreme of these low flow cases occurs when the generating station is in *standby* mode, when two circulating pumps are running and no generating units are in operation, producing no power and providing no heating of the discharge water. The low flow cases are evaluated in combination with extreme conditions in the ocean environment involving tranquil, dry weather, La Niña type summer climate. By superimposing two conditions that seldom occur together (low HBGS flow cases and a calm ocean) the maximum potential impact of the desalination facility on the local ocean environment can be assessed because the dose level of sea salts is highest when the dilution of those salts by mixing and ventilation is lowest. The event analysis also evaluated an*: "average flow case"* based on seasonal mean ocean conditions and average HBGS flow rates (four circulating pumps running and two generating units operating) to determine the most likely degree of dilution of desalination discharge in nearshore waters.

Discussed below are the results of the event analysis of the theoretical extreme cases (the results from the long term simulated modeling using historical data are discussed in detail in Appendix C, *HYDRODYNAMIC MODELING REPORT*).

Distribution of mid-depth seawater salinity in the vicinity of the HBGS outfall under worst-case scenario conditions is depicted on Exhibit 5.10-2, *PROJECTED MID-DEPTH SALINITY OVER THE HBGS OUTFALL –"LOW FLOW" SCENARIO*. The low flow month scenario assumes that the HBGS facility has only two circulating pumps operating (one generating unit) and that no additional mixing from natural causes such as wind or wave action would occur and is extended for 30 days. This low flow scenario has less than a one percent chance of occurring. With a maximum discharge salinity of 55.4 ppt and no additional mixing from natural causes such as wind or wave action (low flow scenario), the highest salinity in the core of the discharge jet is predicted to be 55.0 ppt at mid-depth and 50.1 ppt at the surface.[3] Following the long axis of the teardrop-shaped plume, the concentration of the discharge salinity at mid-point of column depth is projected to decrease to 40 ppt (20 percent above background salinity) within only 20 feet from the HBGS discharge outfall tower. Approximately 100 feet away from the outfall tower, the discharge salinity will decrease to 38.5 ppt, which is only 15 percent above the background seawater salinity. Within 1,200 feet from the outfall tower the discharge salinity will be only 10 percent higher than the background seawater salinity. Hence the size of the plume in terms of average dimensions of its

[3] Hydrodynamic Modeling of Source Water Make-Up and Concentrated Seawater Dilution for the Ocean Desalination Project at the AES Huntington Beach Generating Station. Dr. Scott A. Jenkins Consulting, December 1, 2004.

teardrop shape is 500 feet from the outfall. Under the low flow scenario, the highest salinity on the ocean floor will be 48.3 ppt at the base of the outfall tower, decreasing with distance from the tower, as shown on Exhibit 5.10-3, *PROJECTED SEAFLOOR SALINITY AT THE HBGS OUTFALL – "LOW FLOW" SCENARIO*. The discharge salinity drops to less than 15 percent (38.5 ppt) above the background salinity 100 feet away from the discharge. The bottom discharge salinity is reduced to 10 percent of the background salinity within 1,000 feet from the discharge outfall tower. Stated as an average teardrop shape, the size of the plume is within a distance of 465 feet from the outfall. A maximum of 15.6 acres of ocean floor (benthic area) and 18.3 acres of the water (pelagic area) around the discharge are expected to be exposed to water with a salinity 10 percent higher than the ambient seawater during the low flow scenario. These effects are acute and not expected to last for an extended period of time. Composited for one month, the low flow scenario of maximum discharge salinity and no mixing from natural causes (such as wind or wave action) has less than a one percent chance of occurring.

For normal HBGS operation (four circulating pumps associated with two HBGS generating units), typical environmental conditions extended for 30 days and reverse osmosis facility production of 50 mgd ("average flow" scenario), the salinity at mid-depth in the discharge jet is predicted to be about 41.7 ppt, which is 25 percent higher than background salinity, dropping to 38.3 ppt on the sea surface, as shown in Exhibit 5.10-4, *PROJECTED MID-DEPTH SALINITY OVER THE HBGS OUTFALL – "AVERAGE FLOW" SCENARIO*. The concentration of the discharge salinity at mid-point of column depth is projected to decrease to 38.5 ppt (15 percent above background salinity) within 20 feet from the HBGS discharge outfall tower. Within 500 feet (long axis of tear-drop shape) from the outfall tower the discharge salinity will be 10 percent higher than the background seawater salinity. Hence the size of plume in terms of the average dimensions of its teardrop shape is 330 feet from the outfall.

Assuming the average flow month scenario, the highest salinity on the ocean floor will be 37.6 ppt at the base of the outfall tower, (only 12 percent above background salinity), decreasing with distance from the tower as shown on Exhibit 5.10-5, *PROJECTED SEAFLOOR SALINITY AT THE HBGS OUTFALL – "AVERAGE FLOW" SCENARIO*. The discharge salinity drops to less than 10 percent above the background salinity approximately 430 feet away from the HBGS outfall along the long axis of the tear-drop shaped plume or an average distance of 300 feet. During average monthly case conditions a maximum of 6.8 acres of benthic area and 8.3 acres of pelagic area are expected to be exposed to water with a salinity 10 percent higher than ambient seawater. Average case conditions are expected to occur 50% of the time the desalination facility is operating. As more generating units are operated, salinity of the combined discharge will continue to decrease and a smaller area of the surrounding environment will be exposed to elevated salinities.

The pelagic area potentially exposed to a 10 percent increase in salinity as a result of the desalination facility discharge is relatively small, even in the low flow model. A 10 percent anomaly is within the normal variability of seawater salinity and would be tolerated by most fish species. Salinities predicted for the limited area of the discharge jet vicinity during the low flow scenario are potentially fatal to fish species. Mobile species have the ability to avoid areas that they cannot tolerate and, since sharp salinity gradients may act as barriers to the movements of fish, would likely avoid higher salinity areas.[4] Due to the mobility of the fish, commercial fishing would not be impacted. In addition, fish have been observed feeding in the discharge streams of southern California generating stations including the HBGS discharge. This opportunistic behavior is likely to be reduced or completely discontinued following the addition of the concentrated seawater discharge. However, given that the HBGS discharge stream is not the sole food source for fish in

4 "Salinity: Fishes." Marine Ecology. F. Holliday, 1971.

the region, impacts in this regard would not be significant. No significant impact to local fish populations as a result of the addition of the concentrated seawater discharge is expected.

Exhibit 5.10-2
Projected Mid-Depth Salinity Over the AES Outfall – "Low Flow" Scenario

Exhibit 5.10-3

Projected Seafloor Salinity at the AES Outfall – “Low Flow@ Scenario

Exhibit 5.10-4
Projected Mid-Depth Salinity Over the AES Outfall – "average Flow" Scenario

Exhibit 5.10-5
Projected Seafloor Salinity at the AES Outfall – "average Flow" Scenario

Planktonic species have limited mobility and these species tend to occur in great numbers within the subject site vicinity. Marine planktonic organisms have similar salinity tolerances as local fish species (a 10 percent anomaly can be tolerated by most fish species/planktonic organisms). However, plankton entrained in the discharge stream are likely to be killed, as much by the turbulence and temperature of the discharge (which would occur even without proposed project implementation) as by the salinity increase. No significant increase in plankton loss is expected from the addition of the by-product water to the discharge stream.

The benthic area potentially exposed to a 10 percent increase in salinity as a result of the proposed desalination facility discharge is relatively small in relation to the soft-bottom habitat offshore of Huntington Beach. The benthic community near the discharge structure is dominated by soft-bottom infaunal invertebrate species with limited mobility. Macrofaunal species are the larger members of the benthic community more easily identified in the field and are commonly used to assess the benthic community. Infaunal and other benthic species common offshore of Huntington Beach will have salinity tolerances similar to those of other marine species in the area and should be able to endure salinity increases of up to 10 percent. For most marine organisms, lower salinities are more detrimental than higher salinities, as long as the upper limit does not exceed 40 ppt.[5] During low flow conditions, however, salinities at the base of the discharge tower are expected to exceed 48 ppt, and even during average conditions the salinity of the water at ocean floor immediately around the discharge will be about 38 ppt, higher than local normal oceanic variation.

In times of stress infaunal species can withdraw into the sediments, where the interstitial water is only gradually exchanged with overlaying water. Still, the benthic species at the base of the intake tower will probably be replaced by species which are more tolerant of high salinities. There is also likely to be a general trend of replacement of infaunal species in the area of the 10 percent salinity anomaly footprint with species which are common to areas of fluctuating salinity such as bays, estuaries and river mouths. While species common to the open coast can tolerate salinity fluctuations to some degree, in the open coast these fluctuations are gradual, while operations of either the proposed desalination facility or HBGS may cause rapid changes in local salinity which estuarine species are better adapted to tolerate. Local benthic community diversity is likely to be depressed as a result of desalination facility operations. However, these estuarine species will be functionally similar to the existing community. Still, temporal fluctuations in abundance and diversity of benthic species are the norm for the shallow water communities on the mainland shelf of southern California.[6] Replacement species are most likely to be infaunal species common to local estuaries and bays. The area of this replacement will be relatively small and localized.

In summary, a suite of biological facts indicates that the combined thermal and reverse osmosis discharge would not be large enough to have a significant biological impact on the marine species or communities living near the HBGS (as the reverse osmosis process would not involve the heating or cooling of circulated ocean water, thermal impacts would not occur). Most of the marine organisms living near the HBGS also occur in areas of the SCB and beyond it where salinities can be greater than those that would occur in the combined reverse osmosis and HBGS discharge field. For example, the natural geographic distributions of most of the species living at Huntington Beach extend south to near the tip of Baja California where both coastal temperatures and salinities are as high or higher than those predicted for most areas in the combined discharge field. In addition, some of these species or ones very closely related to them live in the upper part of the Gulf of California where salinities are 36-38 ppt and can be as high as 40 ppt. Thus, many of the species

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5 Benthic Impact of the Discharge from Desalination Plant. C. Pomory, 2000.

6 The Benthic Macrofauna of the Mainland Shelf of Southern California. G.F. Jones, 1969.

present in water around Huntington Beach naturally experience a salinity range comparable to or greater than what is predicted of the combined discharge area.

Hydrodynamic modeling for the proposed project also finds that an elevated salinity zone would occur around the discharge core and that all organisms living within these areas would encounter it. For the animals swimming in the water (some macroinvertebrates, fishes, turtles, mammals), the duration of their elevated salinity exposure would depend on their location and their residence time in the zone. Such a brief exposure time would have no effect on marine mammals, turtles, or most fishes which are good osmoregulators and while most fishes are unlikely to prefer salinities this high, comparative data showing fish easily tolerate high salinities for short periods suggest these salinities could be tolerated for a short time. Also, fishes would have the ability to “sense” such a marked salinity change in the water and could thus alter their swimming direction to avoid it.

In the case of organisms that drift across the elevated salinity area, models developed for the discharge flow field show that planktonic animals drifting though the discharge area would experience elevated salinity for variable times. These times would depend upon both the area of the zone and the organism’s rate of drift and its position relative to the discharge core.

Exposure to the inner discharge core would be less than one hour and exposure to the core’s periphery would be two to three hours. Short-term exposures to higher salinity levels can be tolerated with no impact to marine organisms. While plankton, fishes and other water-column residents would have relatively brief exposures to the highest salinities within the elevated salinity zone, this would not be the case for the benthic organisms occurring in the discharge area. Bottom-dwelling organisms living near the core would experience an increased salinity. One likely biological result of this permanently elevated benthic salinity zone would be some reduction in the total diversity of species living within the zone and the likely increase in the concentration of species having a greater tolerance to the elevated salinity. Such species may already exist in the Huntington Beach bottom community or species from other nearby coastal habitats (tide pool, bays) where salinity is more variable may be recruited to this zone.

In addition, RO treatment requires the pumping of seawater through membrane filters that remove its salts. For each volume of freshwater produced by RO systems an approximately equal volume of doubly concentrated (2x salinity) seawater is also formed. The mass balance analysis of the proposed RO operation at the HBGS requires integration of daily flow volumes through it [e.g., 50 million gallons per day (mgd) each of potable freshwater produced along with 50 mgd of 2x concentrate] and the mixing ratio of the latter with the HBGS cooling water flow (approximately 127 mgd). Because seawater that will undergo RO filtration is pre-treated with iron sulfate (or iron chloride, a chelating agent that coagulates organic solutes and other dissolved materials, and also precipitates a fraction of the trace elements), evaluation of seawater chemistry and physical properties is done before and after pre-treatment and following pretreatment filtration. Another factor affecting mass balance and water chemistry is the volume of RO filter backwash water produced by the intermittent reverse-flow of seawater over the pre-treatment sand filters to rinse away debris.

Chemical comparisons show that all of the trace elements considered in the discharge analysis already occur in the source water and they have the same concentration off Huntington Beach coast as they do in coastal oceans throughout the world. Chemical and physical factor comparisons between the source water and the RO facility discharge stream demonstrate the “concentrating effect” of RO on the source seawater but also show that the RO operation will not significantly affect water turbidity, suspended solids, pH, and oxygen levels.

Mass balance results were based on the assumption of a low HBGS flow rate (127 mgd) and thus conservatively overestimate the concentration that would be expected under normal operation conditions. Nevertheless, the results show that while these trace elements will become slightly concentrated by RO, their discharge concentrations remain far below the numerical water quality standards established to protect aquatic marine life by the Environmental Protection Agency and by the State of California. The only change in discharge water chemistry resulting from the RO facility will be an elevation in dissolved iron. However, this concentration is low and, like the salinity difference between the discharge and receiving waters, the iron concentration will be rapidly diluted to ambient levels. There are no numerical water quality standards governing the discharge of iron, which is usually present in low concentrations in seawater. Moreover, iron is an important ocean nutrient (essential for the growth of phytoplankton) and is likely to be biologically assimilated by primary produce organisms (mainly phytoplankton) in the discharge plume. Additional information is provided in Appendix S, *MARINE BIOLOGICAL CONSIDERATIONS.*

In conclusion, the proposed project's discharge would not have a significant effect on organisms living around the discharge or organisms that would pass through the area. As stated above, most of the marine organisms living near the HBGS also occur in other areas of the SCB where naturally occurring salinities can be higher than what is anticipated at the HBGS outfall. Plankton, fishes, and other water-column species would have brief exposure to the concentrated seawater discharge field, and the area of benthic impacts would be relatively small and localized. In addition, no endangered species or kelp beds exist within the vicinity of the HBGS outfall. As water quality impacts and impacts to marine biological resources are not anticipated to be significant, a separate routine monitoring process is not proposed as part of the project. However, if applicable, biological monitoring during long-term project operation will be conducted as directed by the RWQCB,

Reverse Osmosis Membrane Cleaning Solution

Impacts to the local marine environment due to the discharge of reverse osmosis membrane cleaning solution through the HBGS outfall are anticipated to be less than significant. As stated previously in Section 3.0, *PROJECT DESCRIPTION*, the reverse osmosis system trains will be cleaned using a combination of cleaning chemicals such as industrial soaps (e.g. sodium dodecylbenzene, which is frequently used in commercially available soaps and toothpaste) and weak solutions of acids and sodium hydroxide. Approximate total discharge volumes per reverse osmosis membrane cleaning are shown below in Table 5.10-8, *REVERSE OSMOSIS MEMBRANE SOLUTION DISCHARGE VOLUMES*. Chemicals typically used for cleaning include (it should be noted that the actual cleaning chemicals used will be based on the observed operation and performance of the system once it is placed in operation):

˜ Citric Acid – (two percent solution)
˜ Sodium Hydroxide B - (0.1 percent solution)
˜ Sodium Tripolyphosphate B - (two percent solution)
˜ Sodium Dodecylbenzene B- (0.25 percent solution)
˜ Sulfuric Acid B - (0.1 percent solution)

The "first rinse" treated waste cleaning solution from the washwater tank will be discharged into the local sanitary sewer for further treatment at the OCSD regional wastewater treatment facility. The cleaning rinse water following the "first rinse" will be mixed with the RO facility concentrated seawater, treated waste filter backwash, and the AES plant discharge and sent to the ocean. This "second rinse" water stream will contain trace amounts of cleaning compounds and would be below detection limits for hazardous waste. An Industrial Source Control Permit from the OCSD for discharge of waste cleaning solution into the sanitary sewer system will be required for the project. In addition, the discharge must comply with the limits and requirements contained in the OCSD's

Wastewater Discharge Regulations. Impacts to the local marine environment in this regard would be less than significant.

Table 5.10-8
REVERSE OSMOSIS MEMBRANE SOLUTION DISCHARGE VOLUMES

TYPE OF DISCHARGE	GALLONS	PERCENTAGE
Concentrated Waste Cleaning Solution	4,000	4.4
Rinse Water - Residual Cleaning Solution	11,000	12.0
Rinse Water - Permeate	45,600	50.2
Rinse Water - Concentrate Removed During Rinsing	30,400	33.4
TOTAL DISCHARGE (gallons)	**91,000**	**100**

An alternative to discharging the "first rinse" of the RO membrane cleaning solution into the OCSD system is to discharge the solution ("first rinse" and all subsequent rinses) into the Pacific Ocean via the HBGS outfall. On a typical day, this alternative would blend 200,000 to 300,000 gallons of cleaning solution at a rate of 150 to 200 gpm (0.2 to 0.3 mgd) with 50 mgd of concentrated seawater by-product discharge, 10-15 mgd of treated filter backwash, and 400 mgd of HBGS cooling water discharge. Under a low flow scenario (high membrane cleaning solution concentration and low concentrations of concentrated seawater discharge, filter backwash, and HBGS cooling water discharge), the membrane cleaning solution would be diluted at a ratio of 260 to one. The majority of the chemicals within the membrane cleaning solution would be either below detection levels or regulatory limits, even before dilution with other desalination facility and HBGS discharges. Dilution at a 260 to one ratio would further minimize impacts to the marine environment and would assure NPDES compliance. Modeling for this discharge under various concentrations was performed, and is included in Appendix K, *RO MEMBRANE CLEANING SOLUTION DISCHARGE TEST STREAM DATA*.

Impingement and Entrainment

Potential impacts to marine biological resources in regards to impingement and entrainment effects of the proposed source water withdrawal of the desalination facility from the cooling water system discharge of the HBGS are analyzed within Appendix T, *INTAKE EFFECTS ASSESSMENT* (Tenera, 2004). Impingement occurs when larger fishes and invertebrates are trapped against the generating station's cooling water intake screens, while entrainment occurs when small planktonic organisms are drawn through the intake screens and through the generating station's cooling water system. Exhibit 5.10-6, *HBGS INTAKE SCREENING PROCESS,* depicts the HBGS facility's intake screening process.

Two separate and unrelated entrainment studies are being conducted at the HBGS site. A long-term study, in connection with a re-powering project certified by the CEC, is underway to study entrainment effects of the HBGS's cooling water intake system. The CEC required AES to perform a study of the power plant's cooling water intake system as a condition of re-powering certification.

The CEC entrainment study is not a 316(b) study, but was designed using the same sampling methodologies and data analyses employed in several recently completed 316(b) studies (Tenera 2000 a, b, 2001).

INSERT EXHIBIT 5.10-6, HBGS INTAKE SCREENING PROCESS

The second, but unrelated entrainment study at the site is the desalination feedwater intake study included herein. It should be noted that the proposed project's feedwater withdrawal is not subject to intake regulation under the Federal Clean Water Act (CWA) Section 316(b). The project does not include a cooling water intake structure (CWIS). The CWIS is part of the HBGS existing operations and is presently regulated under Section 316(b). The desalination facility's feedwater would be withdrawn from the HBGS discharge and not directly from the open ocean, and its withdrawal does not affect HBGS intake requirements. The project does not require the HBGS to increase the quantity of water withdrawn nor does it increase the velocity of the water withdrawn. However, taking under consideration that the project will withdraw intake seawater from the generating station discharge flow, the study conducted was consistent with the intent of Section 316(b) which requires "…the location, design, construction, and capacity of cooling water intake structures… are based on the best technology available to minimize the adverse environmental impact associated with the use of cooling water intake structures" (USEPA 2004). The desalination intake study, which is also not a 316(b) study (as none is required for the desalination facility intake), is designed to investigate the potential for desalination facility feedwater intake withdrawn from the HBGS cooling water system to increase HBGS entrainment mortality and assess the significance of this potential entrainment effect on the source water.

The proposed project source water intake would not increase the volume, or the velocity of the HBGS cooling water intake nor would it increase the number of organisms entrained or impinged by the HBGS cooling water intake system. Therefore, the impingement effects of the HBGS are not included in assessing the proposed project's effects. This assessment focuses on the effects of the proposed project's entrainment of organisms already entrained by the generating station before they would be returned to the ocean in the cooling water discharge flow.

<u>Impingement</u>

The proposed desalination facility would not cause any additional impingement losses to the marine organisms impinged by the HBGS, as these organisms would not be exposed to further screening prior to entering the desalination facility's pretreatment system.

The proposed desalination facility would not have a separate direct ocean water intake and screening facilities, and would only use cooling water that is already screened by HBGS's intake. As stated in Section 3.0, *PROJECT DESCRIPTION*, should the HBGS cease to operate, the applicant would purchase the HBGS pumps and intake/discharge facilities and continue to produce and distribute potable water, subject to new permits and approvals required due to a change in the project description.

<u>Entrainment</u>

Entrainment sampling for the desalination feedwater was conducted at an onshore point in the HBGS discharge line just before it is returned in conduits to an offshore discharge location. Bi-weekly samples were collected since the beginning of March 2004 by pumping measured volumes of cooling water discharges through small-mesh nets. The preserved samples were sorted in the laboratory and the fishes and target invertebrates were identified to the lowest taxon practicable.

In general, entrainment effects are assessed using the Empirical Transport Model (ETM), as recommended and approved by the California Energy Commission (CEC), California Coastal Commission (CCC) and other regulatory and resources agencies. This model, used for HBGS intake studies and many other California intake effects studies, compares entrainment larval concentrations to source water larval concentrations to calculate the effects of larval removal on the standing stock of larvae in the defined source water. Tidal exchange ratios, source water volumes, cooling water volumes, larval concentrations, and larval durations were variables used in the ETM calculations. Conservative assumptions of HBGS volumes of 127 MGD were used for developing the estimates of potential losses due to desalination facility operations.

The ETM model estimates the proportion of the available larval supply in the source water that is eliminated by entrainment, but makes no assumptions as to the ultimate effects of such losses on the next generation of adult fishes.

The study for the desalination project was also compared with the preliminary results from the 2004 six-month report submitted to the CEC (which is part of the ongoing HBGS intake entrainment and impingement study).

Six taxa (gobies, blennies, croakers, northern anchovy, garibaldi, and silversides) and a group of larvae that could not be identified were found to comprise 97 percent of all the fish larvae present in the HBGS cooling water system from which the proposed project would withdraw its source water supply. Species with high commercial and recreational importance, such as California halibut and rockfishes, were shown to be very uncommon in the HBGS intake flows.

Under HBGS minimum intake cooling water flow of 127 mgd, and assuming 100 percent through-HBGS larval mortality (based on USEPA 2004), the estimated larval fish entrainment loss is 0.33 percent of the total population of larvae in the local area surrounding the HBGS intake.

Based on in-plant testing, the observed mortality of HBGS is 94.1 percent and the combined estimated mortality (utilizing the ETM) of the proposed project and HBGS at flows of 507 mgd would be 95.3 percent (an increase in mortality of 1.2 percent due to the proposed desalination facility) and 98.7 percent at HBGS flows of 127 mgd (an increase in mortality of 4.6 percent due to the proposed desalination facility). This assessment assumes 100 percent mortality of all organisms upon withdrawal into the desalination facility.

Estimated larval fish loss attributed to the proposed desalination facility would be 0.02 percent (based on HBGS entrainment mortality of 94.1 percent) of the total population of larvae in the local area surrounding the HBGS intake. This would be an order of magnitude less than the HBGS larval population entrainment loss of 0.33 percent. The 0.02 percent figure accounts for the incremental amount of larval fish loss resulting from the proposed desalination facility, aside from that of the HBGS.

From a regional perspective, model results for larval gobies, northern anchovy, and white croaker showed that approximately 0.33 percent of the larvae in the HBGS source water could be affected by HBGS operations at 127 MGD; this represents a de minimis fraction of the total numbers of larval fishes in the Southern California Bight. Results were modeled on encounter rates for the most abundant species entrained from the source water. The loss of marine organisms due to the potential entrainment of the proposed project has no effect on the species' ability to sustain their populations. The loss will not have a measurable effect on the source populations of the species in the Southern California Bight and is an order of magnitude lower than the entrainment loss typically caused by HBGS operations.

Calculations have shown that approximately 25,000–37,000 adult gobies and 6,000–71,000 adult northern anchovy may be lost in a four-month period due to full HBGS operation (507 MGD) (MBC and Tenera 2004). Losses attributed to low flow (127 mgd) operations alone would be approximately 25 percent of these amounts. In addition:

- The most frequently entrained species are very abundant in the area of HBGS intake and the Southern California Bight, and therefore, the actual ecological effects due to any additional entrainment from the desalination facility are insignificant.
- Species of direct recreational and commercial value constitute a very small fraction of the entrained organisms in the HBGS offshore intake and therefore, the operation of the desalination facility does not result in significant ecological impact in NEPA/CEQA context.
- The California Department of Fish and Game (DFG) (2001), in their Nearshore Fishery Management Plan, provides for sustainable populations with harvests of up to 60 percent of unfished adult stocks. The maximum “harvest” effect of HBGS operations at 127 MGD is 0.33 percent, significantly below the accepted (DFG) thresholds of 60 percent. The maximum “harvest” effect of the proposed project is 0.02 percent, an order of magnitude less than 0.33 percent, based on HBGS entrainment mortality of 94.1 percent.

Impacts due to operation of the proposed desalination facility in regards to impingement and entrainment are not anticipated to be significant.

MITIGATION MEASURES

None required.

UNAVOIDABLE SIGNIFICANT IMPACTS

None have been identified.